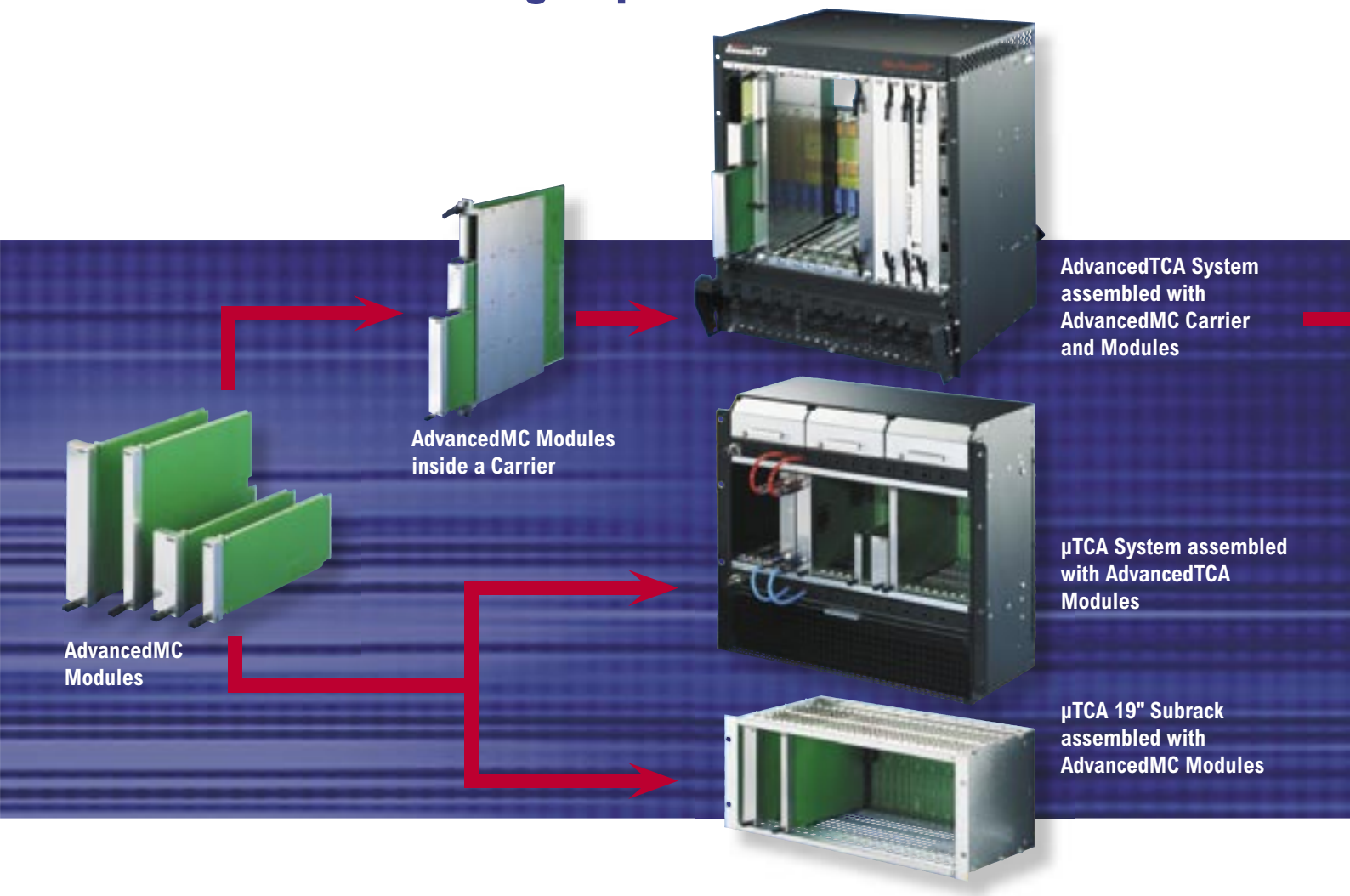
Schroff®

AdvancedTCA® AdvancedMC™ µTCA™

Packaging Solutions

Pentair
Technical Products

New standards for high speed networks


AdvancedTCA System assembled with AdvancedMC Carrier and Modules
AdvancedMC Modules inside a Carrier
µTCA System assembled with AdvancedTCA Modules
AdvancedMC Modules
µTCA 19" Subrack assembled with AdvancedMC Modules

New Demands

Increasing data traffic and new communication services demand flexible, reliable and scalable infrastructures.

Since 2001 PICMG has therefore investigated what the market expects from a new forward-looking standard for telecommunication applications.

The resulting AdvancedTCA standard demands an effective capacity for data transfers up to 2.5 Tbit/s, along with 99.999% availability of the system, meaning that such a system is only allowed to be inoperable for max. 5.3 minutes per year. Furthermore, different protocols, such as Ethernet, Infiniband, Star-Fabric, PCI-Express and Rapid I/O for fast interfaces have to be supported.

Competitive Advantages with a new Equipment Generation

The present situation in the telecommunication sector shows, that 99% of all systems are proprietary. Many telecommunication companies, however, cannot or do not want to develop or operate proprietary systems any longer, but are demanding a standardised infrastructure.

With the new AdvancedTCA equipment generation, hardware and software components from different manufacturers can be utilised and combined. This new technology offers a flexible, cost effective module, with low development costs and short product launch times.

Applications

The AdvancedTCA standard was originally defined for the applications in the telecommunication sector. The platform orientated concept is ideally suited for Wireless, Wireline, Voiceover IP, Video on Demand and Broadband platform services. Switches, routers and other network applications profit through the extremely high data transfer rates of above 2.5 Tbit/s.

Through further development of AdcancedMC and µTCA additional areas of application have been created in the mid and low end area.

AdvancedTCA®

AdvancedTCA (or short ATCA) stands for **Advanced Telecom Computer Architecture**. ATCA is the third main group of standards issued by PICMG (PCI Industrial Computer Manufacturers Group) following the passive PCI Backplane and CompactPCI standards.

To read more, please turn to
Page 4 – Systems
Page 18 – Cabinets

AdvancedMC™

The AdvancedMC standard is an important part of the AdvancedTCA platform.
AdvancedMC modules contain additional boards, which extend the function of a Carrier Board considerably.

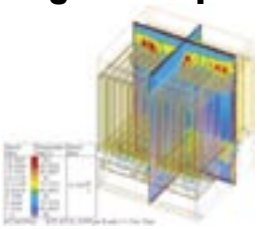
To read more,
please turn to Page 22

µTCA™

MicroTCA is a very modular standard with the aim, to assemble AdvancedMC modules directly on the backplane without the requirement for a Carrier Board in cost critical applications in the low end area.

To read more,
please turn to Page 30

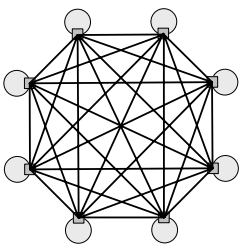
Cooling Concepts



Fast processors create high performance losses and require a carefully thought-out cooling concept – starting from the backplane and up to the cabinet.

To read more,
please turn to Page 36

Standards



The AdvancedTCA, AdvancedMC and µTCA standards have been influenced considerably by Schroff's experts. The focal points of the standards have been summarised for you.

To read more,
please turn to Page 38

Advanced Telecom Computer Architecture

Following the initiative of board manufacturers, such as Intel and Motorola, PICMG (PCI Industrial Computer Manufacturers Group) started the development of an open standard for the so far proprietary platforms in the “Carrier Grade”.

In December 2002, after intensive work of more than 100 members, PICMG issued a new standard that embraces the future, the Advanced Telecom Computer Architecture – AdvancedTCA 3.0 (PICMG 3.0 Rev. 2.0).

AdvancedTCA Specification
Know-how and Expert Knowledge from Schroff!

Foto: Interoperability Workshop 2004 USA

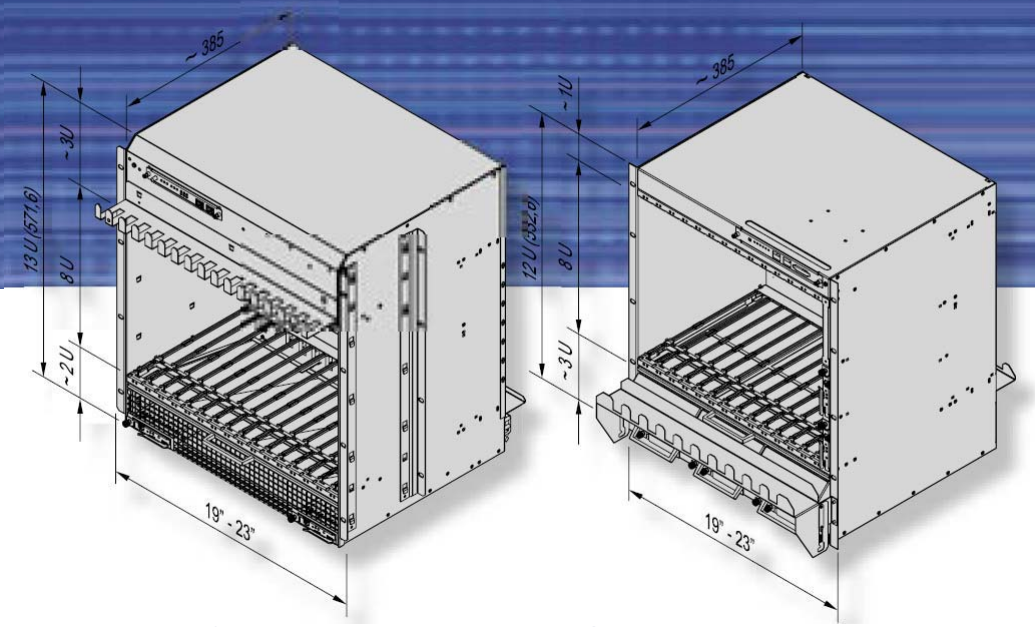
Always one step ahead

As an electronics packaging expert Schroff did not only actively participate in the development of the AdvancedTCA standard, but lead one complete part of it. Based on the experience and Know-how of their specialists, Schroff was involved with the structuring of the mechanical section. Even before the issue of the AdvancedTCA standard, Revision 2.0, Schroff had already supplied the first development systems. In the meantime leading board manufacturers use Schroff systems for their own tests and telecom equipment manufacturers worldwide are counted among Schroff's customers. At regular intervals the members of the AdvancedTCA Working Group meet at so-called Interoperability Workshops (AIW) in order to test the compatibility of their products such as boards, software, chassis and shelf management and gain new knowledge for the refining of the standards. Schroff hosted one of these workshops in the USA.

Complete Solutions from Experts!

Since the beginning of 2005 the first AdvancedTCA systems are in operation. Schroff now offers the third generation of AdvancedTCA systems in different designs, as well as a complete range of accessories, such as front panels, blank panels, shelf managers and backplanes.

AdvancedTCA
stands for high speed and high availability!



AdvancedTCA – Advantages at a Glance:

- System availability to min. 99.999%
- Redundant operation ensures highest reliability
- Hot-swap capability guarantees uninterrupted operation
- High speed transfers. Data transfers up to 2.5 Terabits/s
- Proven performance of data cables > 3.125 Gbits/s
- Support of different protocols for interfaces: Ethernet (PICMG 3.1), Infiniband (PICMG 3.2), Star Fabric (PICMG 3.3), PCI Express (PICMG 3.4), Radpid I/O (PICMG 3.5)
- Performance losses specified to 200 Watt per board
- Systems monitoring via Shelf Manager enables the management of the systems sources and offers perfect protection of the boards via electronic coding

Systems

- Systems available ex stock - from 2U to 13U
- Fully assembled and tested
- Fulfilment of all NEBS (Network Equipment Building Standard) demands

Systems and Components available worldwide – ex stock

16 Slot

- Area of application:
  Central Office/Development Laboratory
- Optimum utilisation of space when assembled in ETSI or 23" frames
- Cooling up to 200 Watt per board
- The system contains:
  - Chassis with 3 hot-swappable cooling units including RTM cooling
  - Redundant power supply DC
  - Dual Star and Full Mesh backplane
  - Shelf Alarm Panel (SAP)
  - Cable management front and rear
  - Use of two redundant Shelf Managers based on Pigeon Point ShMC 500 possible (bussed or radial IPMI)

14 Slot

- Area of application:
  Central Office/Development Laboratory
- Optimum utilisation of space when assembled in 19" frames
- Cooling up to 200 Watt per board
- The system contains:
  - Chassis with 3 hot-swappable cooling units including RTM cooling
  - Redundant power supply DC
  - Dual Star and Full Mesh backplane
  - Shelf Alarm Panel (SAP)
  - Cable management front and rear
  - Use of two redundant Shelf Managers based on Pigeon Point ShMC 500 possible (bussed or radial IPMI)

5/2 Slot

- Area of application:
  Development Laboratory and Test Systems
- For the testing of AdvancedTCA boards, of software and systems design
- The system contains:
  - Chassis with a cooling unit including RTM cooling
  - Power supply AC or DC
  - Full Mesh Backplane
  - Use of two redundant Shelf Managers based on Pigeon Point ShMC 500 possible (bussed or radial IPMI)

Service

- **Global Availability** – Schroff offers a large range of packaging products worldwide ex stock
- **Global Project Support** – Schroff's Project Engineers assist you in finding answers to your questions – worldwide
- **Unique Internet Platform:** www.a-tca.com

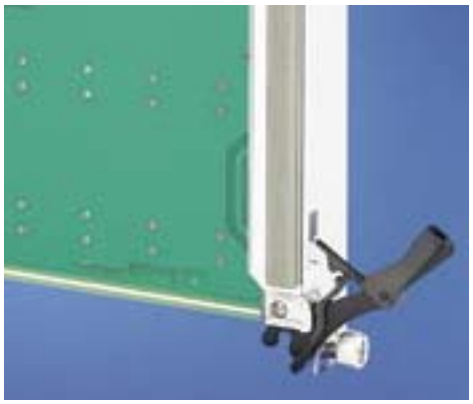
AdvancedTCA Packaging Solutions – stand for „Time to Market“ with Schroff!

Shelf Manager

- Efficient flexible shelf management concept based on Pigeon Point technology (www.pigeonpoint.com)
- Available with integrated fan control
- With electronic coding for the protection of boards and system

Backplanes

- Point-to-point connection structure independent of protocol
- Dual Star up to Full Mesh configuration
- IPMI (Intelligent Platform Management Interface) bussed or radial
- Redundant power supply, divided into up to 4 independent segments



Front Panels

- Stainless Steel or Aluminium extrusion
- Mesh HF seal
- Innovative hot-swappable extractor handles with self-locking mechanism and micro-switch operation
- Customer specific finish, powder coating, screen printing or overlay possible

AdvancedTCA system, 16 slot

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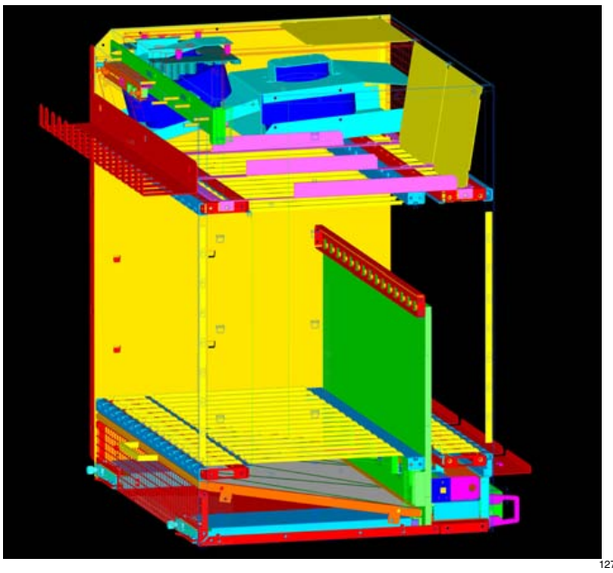
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Shelf Manager

- In accordance with AdvancedTCA standard PICMG 3.0 Rev. 2.0
- 16 slot backplane with Dual Star or Full Mesh topology
- Designed to accept 16 boards, 8 U, 6 HP front and Rear I/O boards
- Two redundant, rear assembled Power Entry Modules (PEM) for power supply 48 V_{DC}/60 V_{DC}
- Three redundant hot-swap capable fan units for cooling up to 200 W per board
- Prepared for two Shelf Managers with Pigeon Point ShMM 500 for bussed or radial IPMI topology
- Shelf Alarm Panel (SAP)
- Including mounting bracket for the installation in ETSI racks or 23" cabinets

Delivery comprises (completely assembled and wired)

Item	Qty	Description
1	1	Subrack 23 U, 96 HP, 280 mm / 70 mm deep
2	1	Backplane 16 slot
3	1	Top cooling section with 3 redundant fan plug-in units with 390 m^3/h (230 cfm) each, with 2 radial fans per unit for the cooling of the front and Rear I/O boards
4	1	Front removable filter mat
5	2	Redundant 48 V_{DC}/60 V_{DC} Power Entry Module (PEM) assembled at the rear, with 4 pairs of cables each per module (8 fuses, 30 A)
6	1	Shelf Alarm Panel (SAP)
7	1	Cable ducting at the front and at the rear of the system

Order Information

Height SU	Width HP	Depth mm	Description	Qty / PU	Order no.
23	96	383	AdvancedTCA system, black, Dual Star backplane, radial IPMI	1	**11592-501**
23	96	383	AdvancedTCA system, black, Dual Star backplane, bussed IPMI	1	**11592-500**
23	96	383	AdvancedTCA system, black, Full Mesh backplane, radial IPMI	1	**11592-503**
23	96	383	AdvancedTCA system, black, Full Mesh backplane, bussed IPMI	1	**11592-502**
Shelf Manager (radial) 1 piece					**21593-376**
Shelf Manager (bussed) 1 piece					**21593-375**
Air filter 1 piece					**21594-144**
Fuse 30 A for Power Entry Module, PU 10 pieces					**21191-207**

- For User Manual and Service Manual, please see information on the Internet
- For replacement parts, please see information on the Internet

AdvancedTCA system, 14 slot

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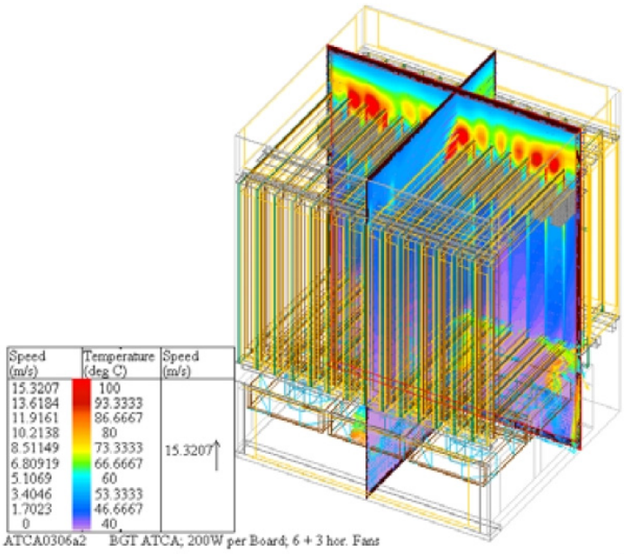

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12705007

Shelf Manager

- In accordance with AdvancedTCA standard PICMG 3.0 Rev. 2.0
- 14 slot backplanes with Dual Star or Full Mesh topology
- Designed to accept 14 boards, 8 U, 6 HP front and Rear I/O
- Two redundant, rear assembled Power Entry Modules (PEM) for the power supply 48 V_{DC}
- Three redundant, hot-swap capable front fan plug-in units for the cooling of up to 200 W per board
- Prepared for two Shelf Managers with Pigeon Point ShMM 500 for busses or radial IPMI topology
- Shelf Alarm Panel (SAP)
- Including mounting bracket for the installation in 23" cabinets

Delivery comprises (completely assembled and wired)

Item	Qty	Description
1	1	Subrack 12 U, 84 HP, 280 mm / 70 mm deep
2	1	Backplane 14 slot
3	1	Fan section at the bottom with 3 redundant fan plug-in units with 270 m^3/h (160 cfm), with 2 fans each for the cooling of front and Rear I/O boards
4	1	Front removable filter mat
5	2	Redundant 48 V_{DC}/60 V_{DC} Power Entry Module (PEM), plugged into the rear, with 4 pairs of cables each per module (8 fuses, 30 A)
6	1	Shelf Alarm Panel (SAP)
7	1	Cable ducting in the front and at the rear of the system

Order Information

Height U	Width HP	Depth mm	Description	Qty / PU	Order no.
12	84	383	AdvancedTCA system, black, Dual Star backplane, radial IPMI	1	**11592-401**
12	84	383	AdvancedTCA system, black, Dual Star backplane, bussed IPMI	1	**11592-400**
12	84	383	AdvancedTCA system, black, Full Mesh backplane, radial IPMI	1	**11592-403**
12	84	383	AdvancedTCA system, black, Full Mesh backplane, bussed IPMI	1	**11592-402**
Shelf Manager (radial) 1 piece					**21593-376**
Shelf Manager (bussed) 1 piece					**21593-375**
Air filter 1 piece					**21596-002**
Fuse 30 A for Power Entry Module, PU 10 pieces					**21191-207**

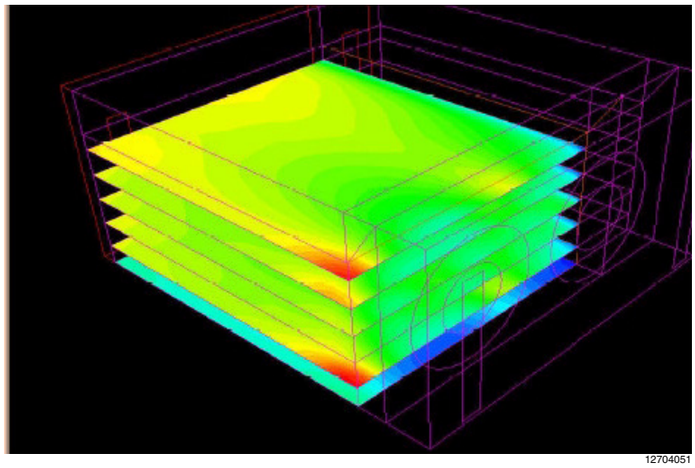
Note

- 13 U AC version available on request
- For User Manual and Service Manual, please see information on the Internet
- For replacement parts, please see information on the Internet

AdvancedTCA system, 5 slot

12705006

AdvancedTCA system with extractable fan unit



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- In accordance with AdvancedTCA standard PICMG 3.0 Rev. 2.0
- 5 slot backplane with Full Mesh topology
- Designed to accept 5 boards, 8 U, 6 HP front and Rear I/O
- Two fans for cooling up to 200 W per board
- Prepared for two Shelf Managers with Pigeon Point SHMM 300
- Can also be used without Shelf Manager
- Voltage supply
  - 48 V_{DC}, two redundant Power Entry Modules (PEM) plugged at the rear
  - AC version with 1000 W power supply, assembled at the rear of the backplane (covers RTM area)

Delivery comprises (completely assembled and wired)

Item	Qty	Description
1	1	Subrack 5 U, 84 HP, 280 mm / 70 mm deep
2	1	Backplane 5 slot Full Mesh
3	1	Telescopic fan unit with 2 fans (24 V_{DC}) including fan control
4a	2	DC: redundant 48 V_{DC} Power Entry Module (PEM), plugged at the rear
4b	1	AC: range 115 … 230 V_{AC}

Order Information

Height U	Width HP	Depth mm	Description	Qty / PU	Order no.
5	84	383	AdvancedTCA system, black, Full Mesh backplane, fan unit extractable, (without 48 V_{DC} power supply)	1	**SYS000766FT**
5	84	383	AdvancedTCA system, black, Full Mesh backplane, fan unit extractable, (without 48 V_{DC} power supply) for Intel "Colorado Springs" Shelf Manager	1	**SYS002334**
5	84	383	AdvancedTCA system, black, Full Mesh backplane, with 750 W AC power supply (uses RTM range)	1	**SYS001916**
Shelf Manager for 5 U system 1 piece					**BPL000763**
Filler panel 4 U, 6 HP for empty Shelf Manager slot, 1 piece					**FPL000765**

Note

- Special configuration available on request
- For User Manual, please see information on the Internet

AdvancedTCA system 3 U, 2 slot

12703003

- In accordance with ATCA standard PICMG 3.0 Rev. 2.0
- 2 slot backplane, one Node slot and one Hub slot
- Designed to accept two boards 8 U, 6 HP
- Three fans for cooling of up to 200 W per board
- Power supply AC or DC
- Easy access to boards via removable top cover

Delivery comprises (completely assembled and wired)

Item	Qty	Description
1	1	Subrack 3 U, 84 HP, depth 383 mm
2	1	Backplane 2 slot, Node - Hub configuration
3	3	Fan
4	2	Power supply 115 - 230 V_{AC}/48 V_{DC}, 500 W

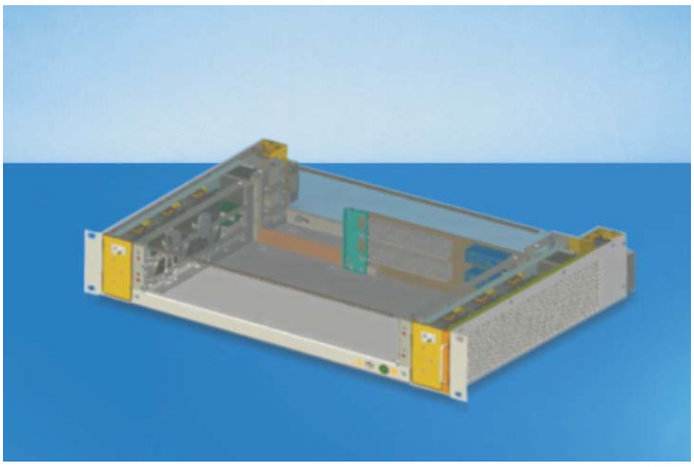
Order Information

Height U	Width HP	Depth mm	Qty / PU	Order no.
3	84	383	1	**SYS000235**

Note

- Special configuration with 800 W AC power supply (hot-swap) available on request

AdvancedTCA System 2 U, 2 slot



12706011

- In accordance with AdvancedTCA standard PICMG 3.0 Rev. 2.0
- Perfect configuration for the introduction to AdvancedTCA
- 2 slot backplane, Node - Node configuration
- Designed to accept two boards, 8 U, 6 HP, front and Rear I/O
- Two hot-swap capable fan plug-in units for cooling of up to 200 W per board and 15 W per RTM board
- Power supply 48 V_{DC}
- Easy access to boards via removable top cover

Delivery comprises

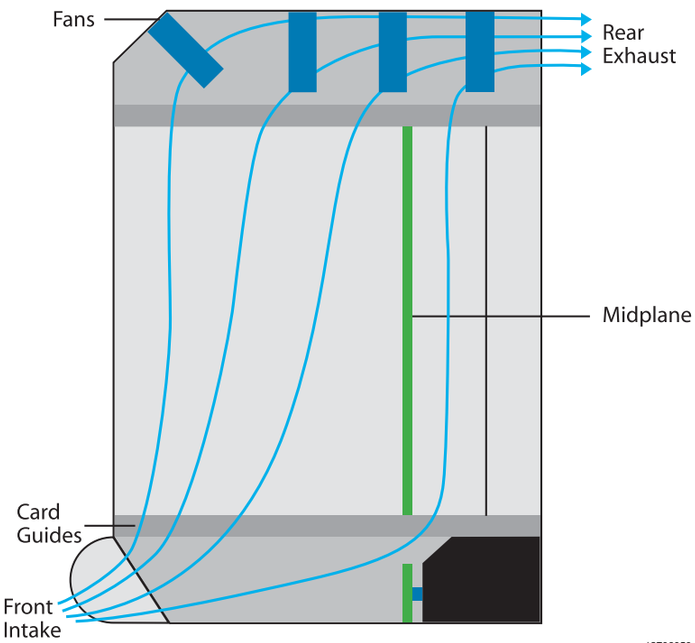
Item	Qty	Description
1	1	Subrack 2 U, 84 HP, 469 mm deep
2	1	Backplane 2 slot, Node - Node configuration
3	2	Fan plug-in unit
4	2	Power supply 48 V_{DC}

Order Information

Height U	Width HP	Depth mm	Order no.
2	84	469	**11596-004**
Air filter 1 piece			**21596-028**

AdvancedTCA system, 12 U, Ventus Shelf, 14 slot

12706012



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electronic solutions

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- In accordance with AdvancedTCA standard PICMG 3.0 Rev. 2.0
- Distributed Intelligent Platform Managment Interface (IPMI) using IPM enabled Field Replaceable Units (FRU's)
- 14 slot backplane with Dual Star
- Designed to accept 14 front boards, 8 U, 6 HP and Rear I/O boards
- Redundant supply voltage 40 V_{DC} ... 72 V_{DC} via 2 Power Entry Modules (PEM) plugged into on the rear
- Three redundant hot-swap fan units for cooling of up to 200 W per board
- Prepared for two Shelf Managers with Pigeon Point ShMM 500 for bussed or radial IPMI topology
- Shelf Alarm Panel (SAP)

Delivery comprises (completely assembled and wired)

Item	Qty	Description
1	1	Subrack 12 U, 84 HP, black, 471 mm deep, for 280 mm / 70 mm deep boards
2	1	Backplane 14 slot Dual Star
3	1	Fan unit with 3 redundant fan units with Intelligent Platform Management (IPM)
4	1	Intelligent Platform Management Interface (IPMI) monitored removable air filter
5	2	Redundant 40 V_{DC} ... 72 V_{DC} Power Entry Module (PEM) with IPM
6	1	Shelf Alarm Panel (SAP)
7	1	Rear and front Cable Management Tray

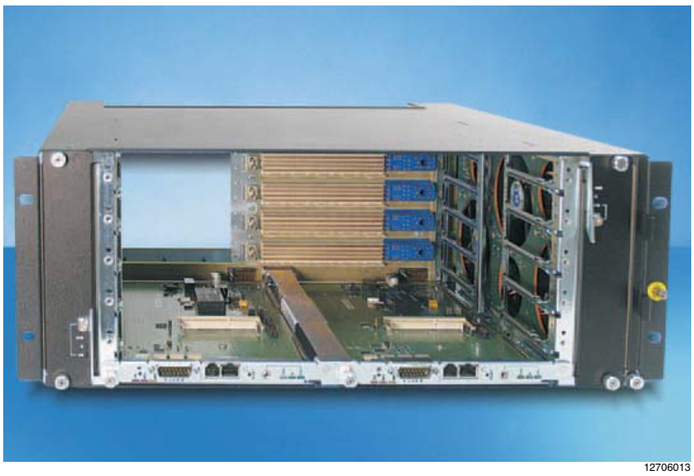
Order Information

Height U	Width HP	Depth mm	Qty / PU	Order no.
12	84	471	1	**VEN12ATCA14DSDCDFBR**
Shelf Manager (bussed) 1 piece				**21593-375**

Note

- UL, cUL, TuV pending
- Other configurations available on request

AdvancedTCA system, 5 U, Zephyr Shelf, 6 slot



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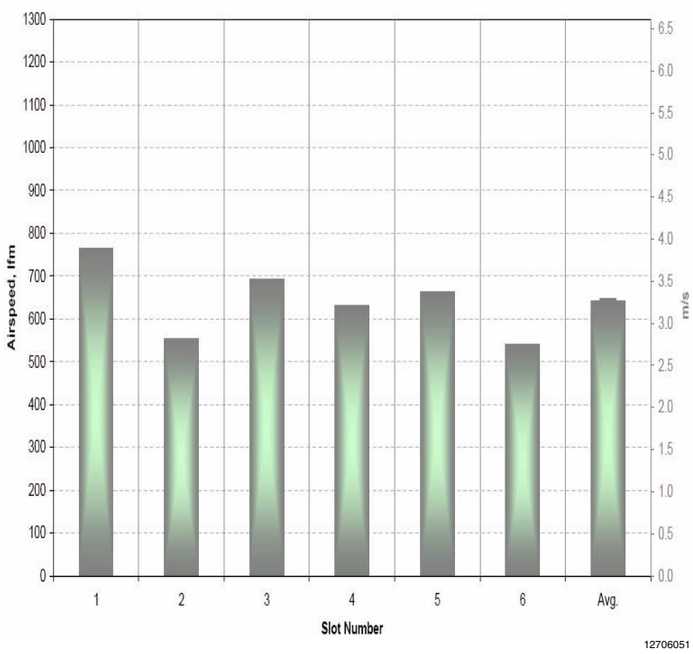

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electronic solutions

30406054

- In accordance with AdvancedTCA standard PICMG 3.0 Rev. 2.0
- Distributed Intelligent Platform Managment Interface (IPMI) using IPM enabled Field Replaceable Units (FRU's)
- 5 slot backplane with Triple Replicated Mesh topology
- Designed to accept 6 front boards, 8 U, 6 HP and Rear I/O boards
- Two hot-swappable fan units for cooling of up to 200 W per board
- Provisions for two Shelf Managers with Pigeon Point ShMM
- Redundant supply voltage 48 V_{DC} ... 72 V_{DC} (2 places) via 2 Power Entry Modules (PEM) plugged into on the rear

Delivery comprises (completely assembled and wired)

Item	Qty	Description
1	1	Subrack 5 U, 84 HP, black, for 280 mm / 70 mm deep boards
2	1	Backplane 6 slot Triple Replicated Mesh
3	1	Fan unit with 2 removable fan units with Intelligent Platform Management Control (IPMC)
4	1	Intelligent Platform Management Interface (IPMI) monitored air filter
5	2	Redundant 48 V_{DC} ... 72 V_{DC} (2 places), Power Entry Module (PEM) with IPMC plugged into on the rear

Order Information

Height U	Width HP	Depth mm	Qty / PU	Order no.
5	84	445	1	**ZR5ATC6TMDPEM2N**
Shelf Manager (bussed) 1 piece				**21593-375**

Note

- UL, cUL, TuV pending
- Other configurations available on request

Shelf Manager for 14 / 16 slot system

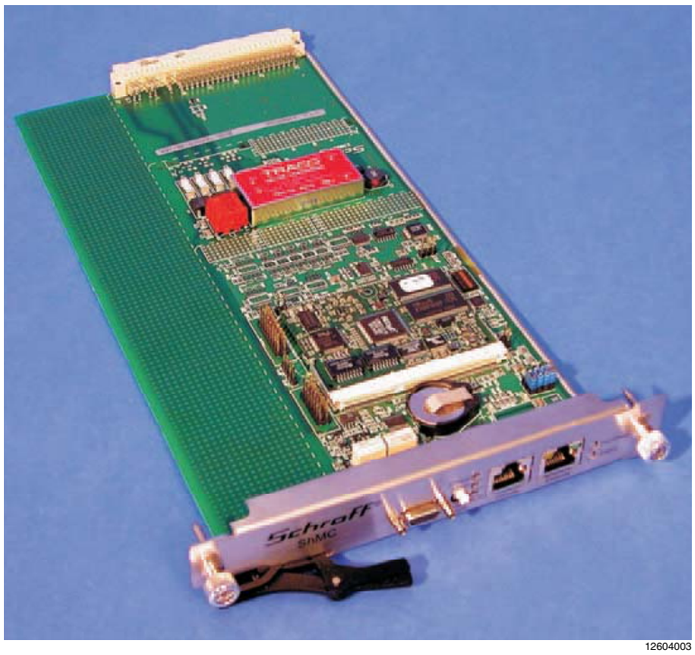
12705007

- Up to 2 Shelf Manager applicable per system
- Based on Pigeon Point Shelf Management technology
- Including stainless steel front panel and AdvancedTCA handle (black)

Order Information

Height U	Width HP	Depth mm	Description	Qty / PU	Order no.
2	6	280	Shelf Manager, radial version	1	**21593-376**
2	6	280	Shelf Manager, bussed version	1	**21593-375**
Filler panel to cover unused Shelf Manager slot, width 15.22 mm, height 99.33 mm, 1 piece					**21596-012**
Cable RJ 45 category 5 - D-SUB-9 pole plug, length 1 m, 1 piece					**CBL000002**

Shelf Manager for 5 U chassis



12604003

- Up to 2 Shelf Managers per system
- Based on Pigeon Point Shelf Management technology

Order Information

Height U	Width HP	Depth mm	Description	Qty / PU	Order no.
4	6	280	Shelf Manager	1	**BPL000763**
Filler panel 4 U, 6 HP for unused Shelf Manager slot, 1 piece					**FPL000765**
Cable RJ 45 category 5 D-SUB-9 pole plug, length 1 m, 1 piece					**CBL000001**

AdvancedTCA front panel kit

12705008

Delivery exclusive of board

- Stainless steel or Al extrusion versions
- Including Schroff hot-swap handle
- Including special support for component side board fixing
- Including EMC Fabric Mesh or Copper Beryllium (CuBe)

Delivery comprises

Item	Qty	Description
1	1	Stainless steel or Al profile front panel incl. alignment pin and knurled screw M3
2	1	Lower handle incl. layer
3	1	Top handle incl. layer
4	1	Mesh seal
5	1	Assembly kit (M2.5 screw incl. screw safety paint)

Order Information

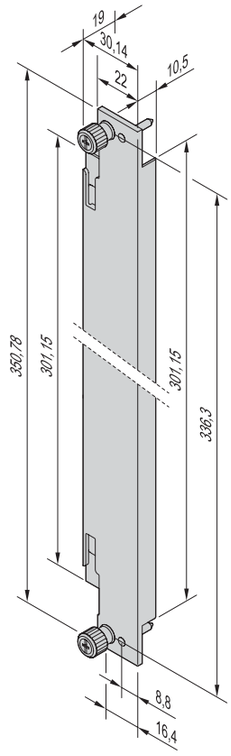
Height U	Width HP	Description	Qty / PU	Order no.
8	6	Front panel kit, stainless steel with Mesh seal	1	**21591-100**
8	6	Front panel kit, Al extrusion with Mesh seal	1	**21591-102**

Note

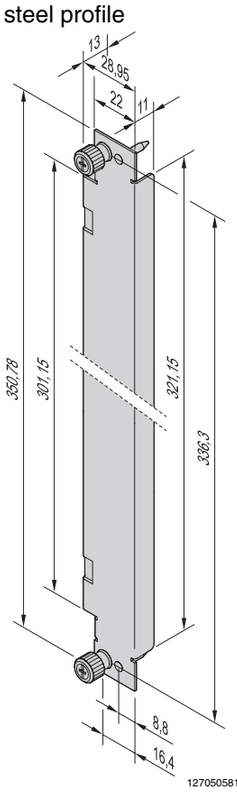
- Front panels with CuBe gasket available on request
- Front panels with board cover available on request
- Schroff offers a full range of front panel modification services including customer specific cut-outs, overlay, silkscreening via the Front Panel Express Service
- For drawings please refer to www.a-tca.com

AdvancedTCA front panel

Al extrusion



Stainless steel profile



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- Stainless steel or Al extrusion
- Mesh seal

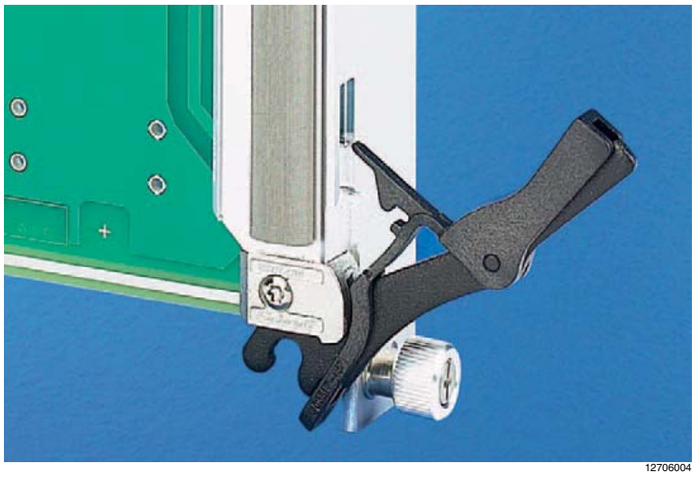
Order Information

Height U	Width HP	Description	Qty / PU	Order no.
8	6	Front panel, Al profile	1	**31591-454**
8	6	Front panel, stainless steel profile	1	**31591-422**
Mesh seal, self-adhesive for AdvancedTCA front panels PU 10 pieces				**21591-092**

Note

- CuBe gasketing available on request
- Please ask your Schroff representatives for further AdvancedTCA front panel versions including metal handle, alternative front panel material/ finish, "side two cover" versions and customised dimensions

AdvancedTCA handle



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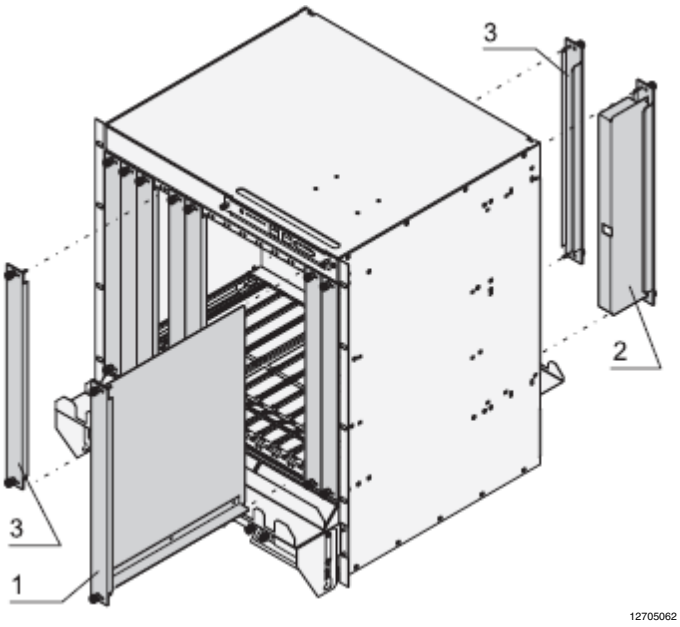
Delivery comprises

Item	Qty	Description
1	10	Lever, St, 2 mm, black
2	10	Plastic part, black
3	10	Die-casting (at top/at bottom)
4	10	Screw M2.5 x 12, self-locking
5	10	Washer

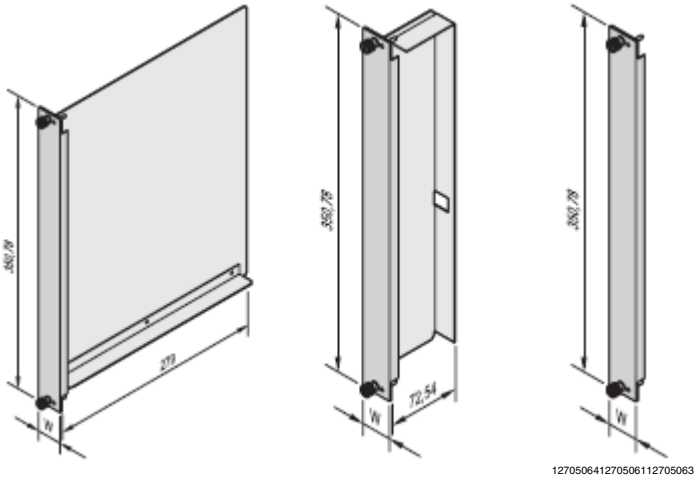
Order Information

Description	Qty / PU	Order no.
Lower handle assembly kit	10	**20817-476**
Top handle assembly kit	10	**20817-477**

AdvancedTCA filler panel



Item 1 Item 2 Item 3



- Front panel stainless steel or Al profile
- 6 HP filler panels in 3 versions
  - Front: filler panel with air baffle (item 1, baffle which blocks air from unused slots)
  - Rear: filler panel with air baffle (item 2, baffle which blocks air from unused slots)
  - Filler panel only (item 3)

Delivery comprises

Item	Qty	Description
1	1	Filler panel
2	1	Separating panel (front or rear)

Order Information

Item	Height U	Width HP	Depth mm	W mm	Description	Qty / PU	Order no.
1	8	6	280	30.14	Filler panel Al profile, incl. air baffle with Mesh seal	1	**21596-008**
1	8	6	280	28.95	Filler panel stainless steel incl. air baffle with Mesh seal	1	**21591-079**
2	8	6	70	30.14	Filler panel Al profile incl. air baffle with Mesh seal	1	**21591-107**
2	8	6	70	28.95	Filler panel stainless steel incl. air baffle with Mesh seal	1	**21591-099**
3	8	6	–	30.14	Filler panel Al extrusion with Mesh seal	1	**21591-104**
3	8	6	–	28.95	Filler panel stainless steel with Mesh seal	1	**21591-097**

Note

- Version with CuBe seal available on request

High demands on Cooling

Processors and electronic components are becoming increasingly smaller and more efficient and through this, heat loss which is given off into the environment increases. Heat losses of more than 6 kW in a cabinet cannot effectively be dissipated by conventional air cooling alone. A far more efficient way to dissipate these higher requirements is to move to an air/water cooling concept, as water has a heat capacity which is higher by a factor of 4000 in relation to volume in comparison to air.

Schroff's complete Solution

Based on these demands Schroff has developed the VARISTAR LHX 20 with integrated air/water heat exchanger. Heat losses of 20 kW per cabinet can be dissipated safely and efficiently, without direct emission of heat into the environment.

Cool Times with the Complete Solution from Schroff

VARISTAR for AdvancedTCA Assembly

Air/water heat exchanger (LHX 20)

Applications

The VARISTAR LHX 20 was developed for the installation of AdvancedTCA systems.
The dimensions of the cabinet are aligned to the assembly space and air flow required for AdvancedTCA systems. The performance data of the air/water heat exchanger can be evaluated directly with the AdvancedTCA Shelf Manager. Furthermore the VARISTAR LHX 20 is especially suited for server cabinet (particularly blade servers) and other cabinets with high performance losses.

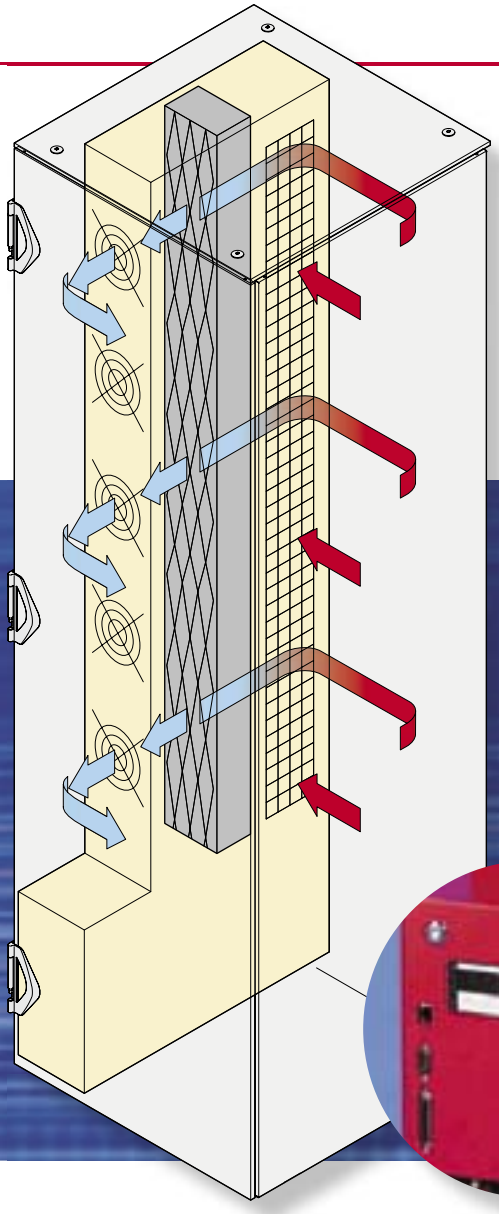
VARISTAR

The joint development of the cabinet platform VARISTAR and the air/water heat exchanger guarantees the optimum co-ordination of cabinet and cooling.

- Type of protection IP 55
- Static load-carrying capacity up to 1000 kg
- High flexibility with extensive range of assembly parts
- Intelligent cabling

Air/Water Heat Exchanger (LHX 20)

- Cooling performance up to 20 kW
- Air movement volume from 1000 to 3000 m^3/h
- Water flow temperatur 6 °C to 15 °C
- Ambient conditions:
  Temperature range 5 °C to 70 °C and relative humidity 5 % to 85 %
- Air expulsion adjustable from 18 °C to 30 °C
- Pressure loss ≤ 0.5 bar



Operating principle of the air/water heat exchanger

SERVICE ...
... the number one priority at Schroff

From the start our application engineers will be at your side worldwide. Components which are available ex stock provide short delivery times, which save time and money. In the after sales area too we offer extensive support. Our friendly, worldwide team of experts is at your disposal at all times.

Cooling capacity up to 20 kW per cabinet

Electronic Monitoring Unit with Display and Interfaces

Safety and Monitoring

During the development of the LHX 20 particular importance was placed on safety and the monitoring functions:

- System monitoring through AdvancedTCA Shelf Management
- Interface RS 232 for external cabinet monitoring
- Redundant $48V_{DC}$ supply
- Condensation is controlled with an integrated droplet collector that avoids water in the air expulsion area
- The water and power supply is arranged from the bottom

VARISTAR LHX 20 – advantages at a glance

- Even cooling of all systems over the entire assembly height
- The entire heat loss is expelled via the cool water circulation
- Optimum system adjustment and safety through:
  - preventative control and regulation
  - integrated alarm and communication interfaces
- Noise level smaller than 55dB(A), even suitable for office environments

VARISTAR LHX 20 for AdvancedTCA

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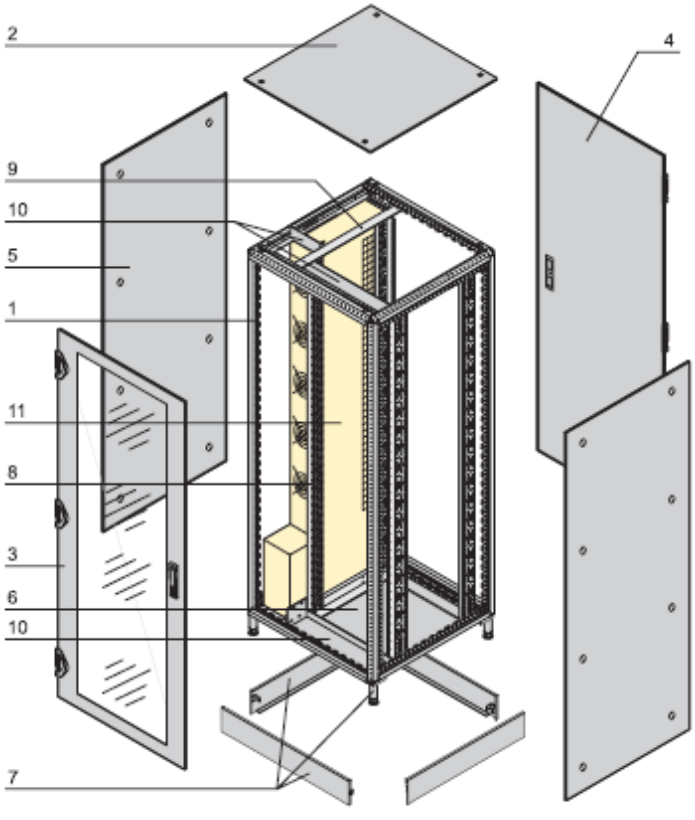

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- Cabinet to IP 55, RAL 7021 with air/water heat exchanger
- Assembly dimensions adjusted to the installation of AdvandedTCA subracks (cabinet depth 800 mm)
- Air/water heat exchanger 20 kW optionally for voltage supply of 48 V_{DC} or 230 V_{AC}, assembled at the left (assembly to the right possible)
- Max. static load-carrying capacity of the 19" plane: 800 kg

Delivery comprises (completely assembled and GND/earthed)

Item	Qty	Description
1	1	Welded basic frame, St profile, RAL 7021, zinc-plated with all-round seal IP 55
2	1	Flat top cover, St, RAL 7021
3	1	Front door, glazed, RAL 7021, safety glass 6 mm, 180° hinge, 4 point locking, lever handle for optional DIN profile half cylinder
4	1	Rear door, St, RAL 7021, 180° hinge, 4 point locking, lever handle for optional DIN profile half cylinder
5	2	Side panel screw-fixed, St, RAL 7021
6	1	Base plate, St, RAL 7021, cable entry at rear, entry for water connection at front, connections can be sealed with sliding panels
7	1	Base/plinth 100 mm, St, RAL 7021, removable covers, adjustable feet integrated
8	4	19" panel/slide mount with EIA cut-outs, St, RAL 7021, 175 mm recessed at front, distance 500 mm between front and rear 19" plane
9	2	Support rail for the assembly of the air/water heat exchanger and 19" panel/slide mounts, St, RAL 7021
10	4	Air baffle, for optimal airflow, St, RAL 7021
11	1	Air/water heat exchanger, 20 kW, RAL 7021, assembled on the left
12	1	User Manual

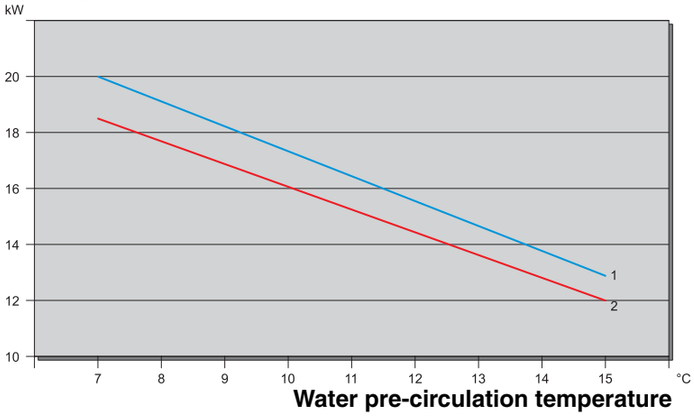
Order Information

Height U	Height H mm	Width W mm	Depth D mm	Description	Order no.
42	2100	800	800	230 V_{AC}	**10130-010**
42	2100	800	800	48 V_{DC}	**10130-011**
DIN half cylinder, common locking (1 key fits into all locks) incl. 2 keys					**25127-995**
Lifting eye PU 4 pieces					**23130-072**

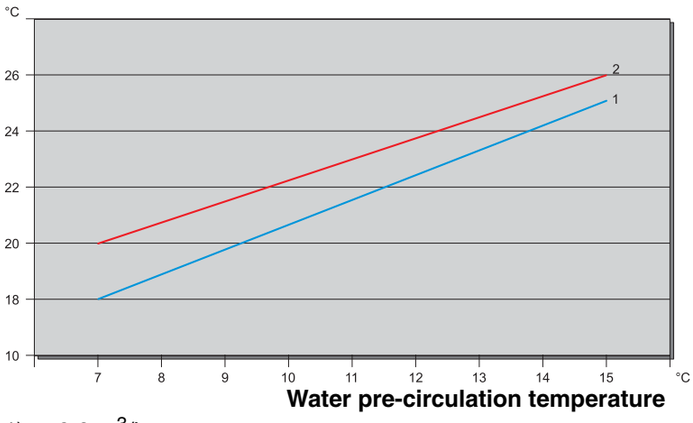
■ Dimensions air/water heat exchanger, see page 19

Technical data LHX 20 (only air/water heat exchanger)

Cooling performance *)



Air expulsion temperature *)



1) at 2.8 m^3/h water

2) at 1.55 m^3/h water

*)at constant air intake temperature of 40 °C

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Dimensions LHX 20

Cooling performance	
Cooling performance	**up to 20 KW**
Cooling performance measured with cool water intake temperature of 15 °C and water circulation volume of 1.55 m^3/h, air expulsion temperature 25 °C	12 KW
Adjustment range air expulsion temperature	18 ... 30 °C (in 0.1 °C increments)
Max. deviation	± 2 K
Water circulation	
Cooling medium[1)]	Water
Water intake temperature[2)]	6 ... 15 °C
Water circulation volume	up to 2.8 m^3/h
Pressure loss in the equipment at 1.55 m^3/h	0.5 bar
Water pipe	Copper
Water connection intake/exit	Rp 1"
Condensation connection	Rp $^1/_2$"
Air circulation	
Air flow regulated, dependent on temperature	1000 .... 3000 m^3/h
Electrical data AC	
Supply voltage (single phase)	230 V_{AC} (50/60 Hz)
Max. current intake	4.3 A
Max. power intake	700 W
Apparent output at full capacity	990 VA
Back-up fuse	10 A
Electrical data DC	
Supply voltage	48 V_{DC}
Max. current intake	13 A
Max. power intake	624 W
Back-up fuse	16 A
Interface	
ST-Bus (RJ 45)	Connection possible for external use and digital display
RS 232 (SUB-D 9 pole)	ASCII protocol, status indication: temperature, humidity level, fan operation times, target values
Digital input/output signals (SUB-D 25 pole)	External input/output, alarm output and warning
General data	
Type of protection	IP 20
Ambient temperature during transport	–25 ... 70 °C
Relative humidity	5 ... 95 %
Weight	78.5 kg (82 kg with water)

1) For trouble-free operation of the air/water heat exchanger the water conditions have to be adhered to (VDE 3803, please also see User Manual)

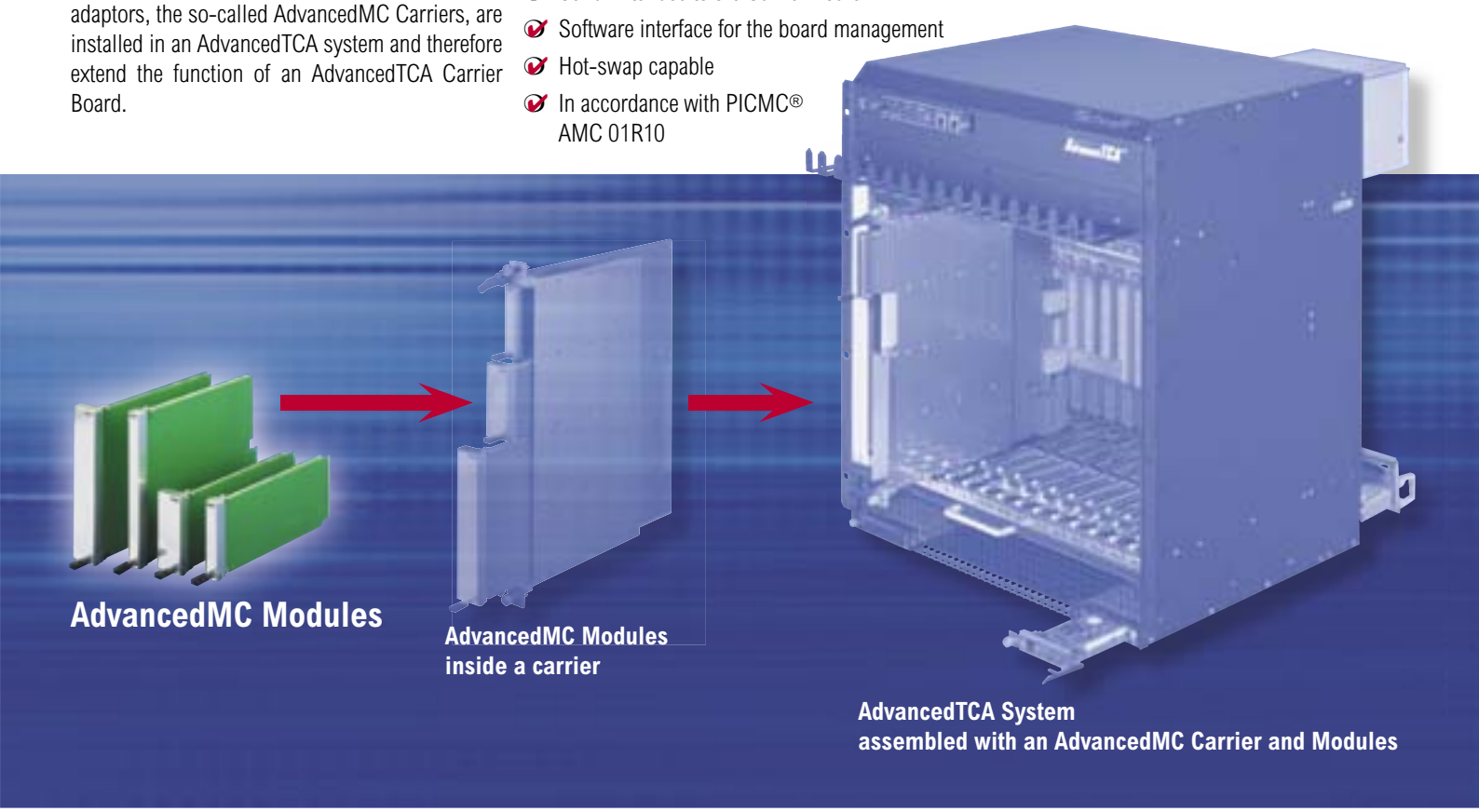
2) With water intake temperatures of < 6 °C and > 15 °C a precise control cannot be achieved

AdvancedMC Module

The AdvancedMC standard is an important part of the AdvancedTCA platform. AdvancedMC modules are Mezzanine modules, which with corresponding adaptors, the so-called AdvancedMC Carriers, are installed in an AdvancedTCA system and therefore extend the function of an AdvancedTCA Carrier Board.

The central components of AdvancedMC are the mechanics of the module and the Carrier

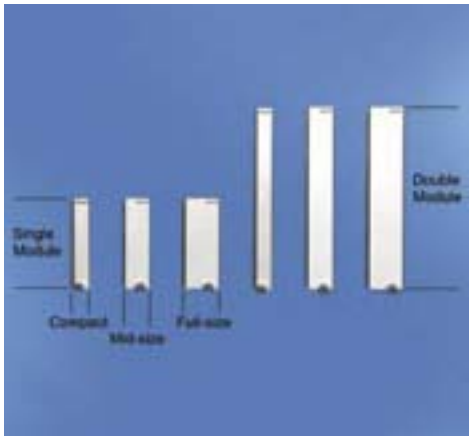
- Serial interface to the Carrier Board
- Software interface for the board management
- Hot-swap capable
- In accordance with PICMC® AMC 01R10



AdvancedMC Modules

AdvancedMC Modules inside a carrier

AdvancedTCA System assembled with an AdvancedMC Carrier and Modules



In the AdvancedMC.0 standard at present 6 module sizes have been determined

Single height: Single
Double height: Double

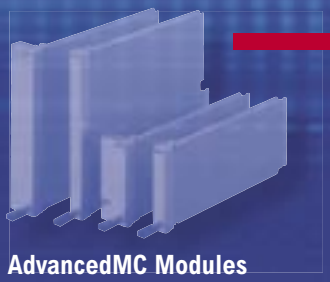
In widths:

Compact: 3 HP
Mid-size: 4 HP
Full-size: 6 HP

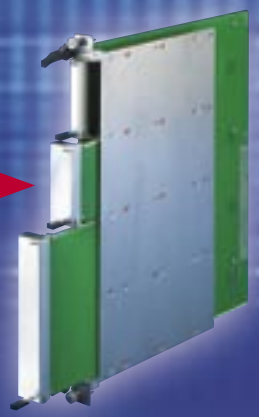
2 Slot Development System

AdvancedMC Carrier

AdvancedMC carriers are frame-type plug-in units, which like plug-in units, are inserted into an AdvancedTCA system. The standard defines different versions of carriers.
The basic construction and the outside dimensions are always the same, the differences show themselves in the arrangement of the carrier backplane.

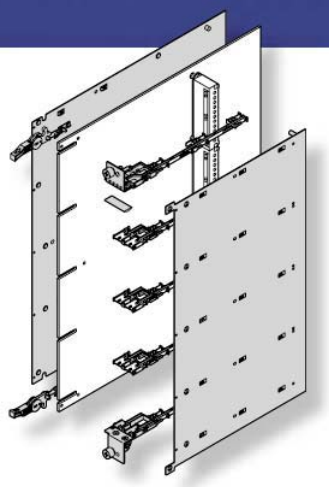


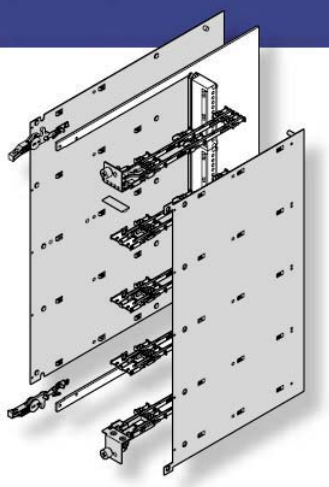
AdvancedMC Modules

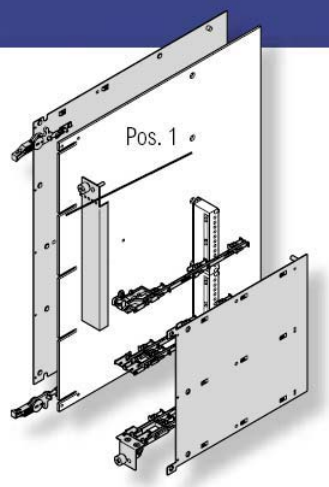


AdvancedMC Modules inside a Carrier

AdvancedTCA System assembled with AdvancedMC Carrier and Modules







Conventional-Carrier

The carrier backplane is continuous and enables complete board assembly. Assembly with max. 4 Single Full-size AdvancedMC modules. Compact modules cannot be used.

Cutaway-Carrier

The carrier backplane has been cut away in the area of the modules. Assembly with max. 8 Single Compact-AdvancedMC modules, or a combination of Full-size and Compact modules.

Hybrid-Carrier

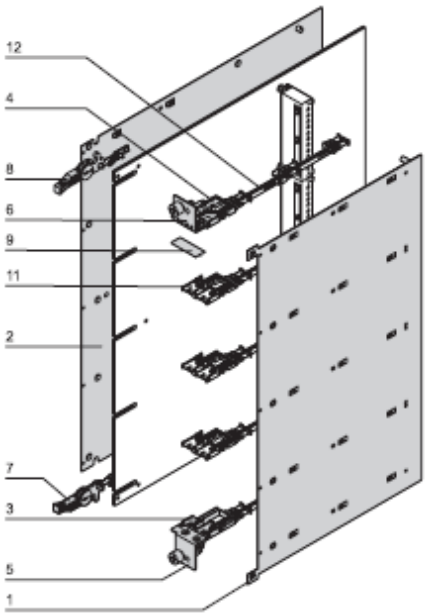
The carrier backplane can correspond to that of a Conventional-Carrier or it can be a combination of Conventional- and Cutaway-Carrier. The number of modules used depends on the size of the Carrier front panel (item 1).

AdvancedMC Carrier mechanics

12805002

- Carrier mechanics for Mezzanine module, stainless steel (EMC shielded)
- 1 slot AdvancedMC chassis in accordance with PICMG standard AdvancedTCA RC 1.1
- Extraction mechanics in accordance with AdvancedTCA and AdvancedMC standards, insertion / extraction mechanics for micro switch operation (hot-swap)
- Height 8 U, width 6 HP, to accommodate up to 8 AdvancedMC modules
- Identical mechanics for Conventional and Cutaway board

With Conventional board



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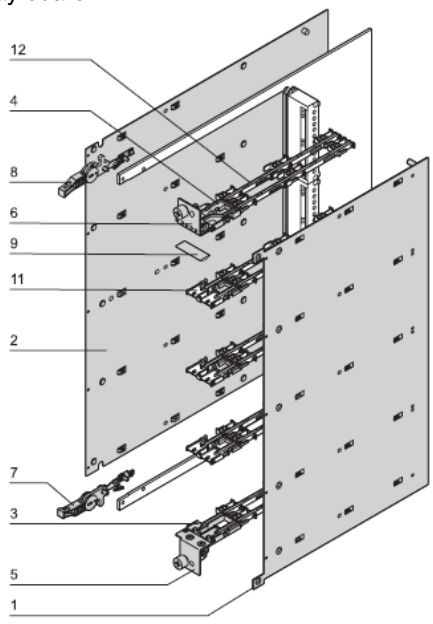
With Cutaway board



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Delivery comprises (kit)

Item	Qty	Description
1	1	Cover B (on the right), stainless steel, 0.6 mm, insulated interior, exterior with protection film
2	1	Cover A (left), stainless steel, 0.6 mm, insulated interior, exterior with protection film
3	1	Splitting extrusion (strut) at bottom, Zn die-cast, nickel-plated
4	1	Splitting extrusion (strut) at top, Zn die-cast, nickel-plated
5	1	Front panel at bottom, stainless steel, 1 mm, pressed in alignment pin and retention screws
6	1	Front panel at top, stainless steel, 1 mm, pressed in alignment pin and retention screws, with holes for LED
7	1	Standard insertion / extraction mechanics, with micro switch operation, lever plastic black
8	1	Standard insertion / extraction mechanics, lever plastic black
9	1	EMC profile seal, core: foam, sleeve: textile cladding with CuNi mesh
10	1	Assembly kit
11	1	Strut A-B (3 pieces), strut for cover A (3 pieces), strut for cover B (3 pieces), ESD clip (8 pieces)
12	10	AdvancedMC guide rail, PBT, UL 94 V-0, red

Order Information

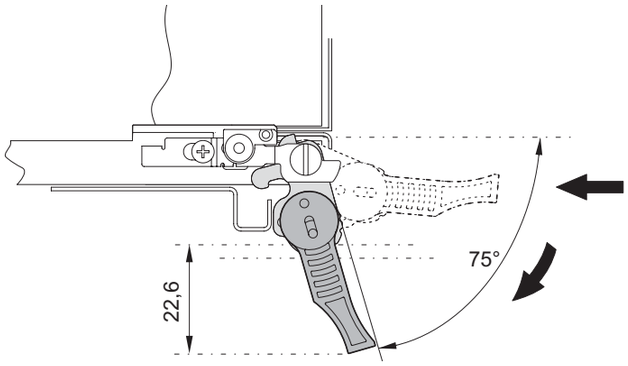
Description	Item	Qty / PU	Order no.
AdvancedMC Carrier mechanics for Conventional / Cutaway board with struts, ESD clip, guide rail	1 ... 12	1	**10849-001**
AdvancedMC Carrier mechanics for Conventional / Cutaway board	1 ... 10	1	**10849-002**
Micro switch for AdvancedTCA Carrier module (normally open) for soldering (SMD), PU 10 pieces			**20849-064**
Micro switch for AdvancedMC Carrier module (normally closed) for soldering (SMD), PU 10 pieces			**20849-020**

Note

- Hybrid Carrier, see page 23
- Carrier for Mid-size AdvancedMC modules, see page 23
- Please order strut (item 11), ESD clip and guide rail (item 12) separately, see page 24
- AdvancedMC module mechanics, see page 25
- Description of micro switch for AdvancedMC Carrier module, see page 27

Differences standard / MF handles for AdvancedMC Carrier

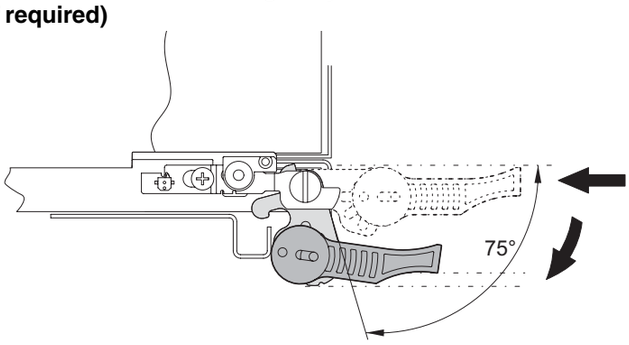
Standard front handle - included in delivery comprise of Carrier module



12805073

- Insertion / extraction mechanics: 75° opening angle
- Insertion / extraction in one step
- Swing range: 23 mm below and above the separation line
- Included in delivery of Carrier

MF handle can be exchanged by a standard handle (if required)



12805072

- Insertion / extraction mechanics: 75° opening angle
- Insertion / extraction in 3 steps (2 operations)
- Small swing range (0 mm) below and above the pitch line. The lower or upper limit of the carrier is not exceeded during the extraction.
- On request

AdvancedMC Carrier mechanics for Hybrid boards

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- On request

AdvancedMC Carrier mechanics for Mid-size AdvancedMC modules

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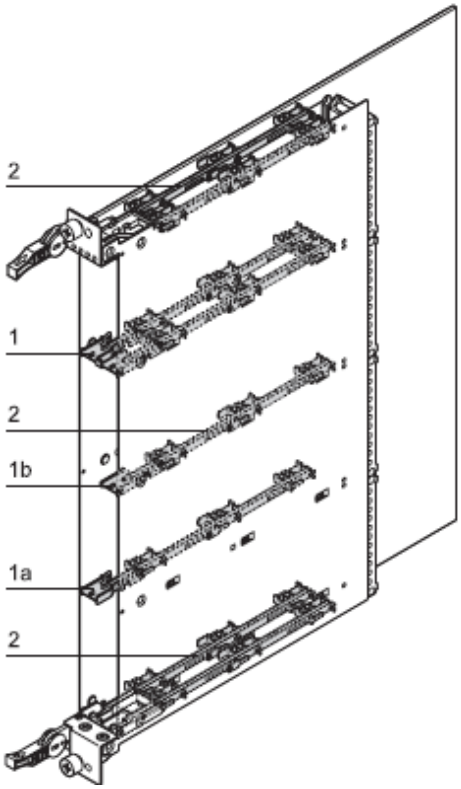
- On request

Guide rail for AdvancedMC modules



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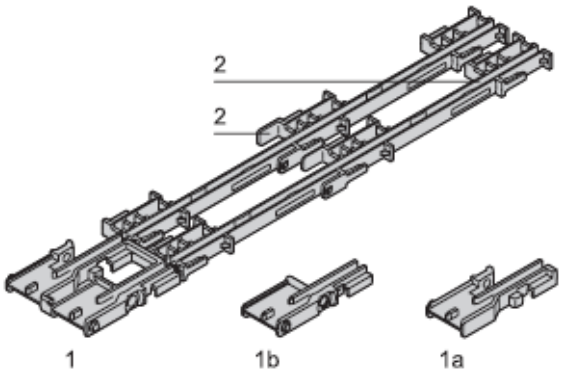

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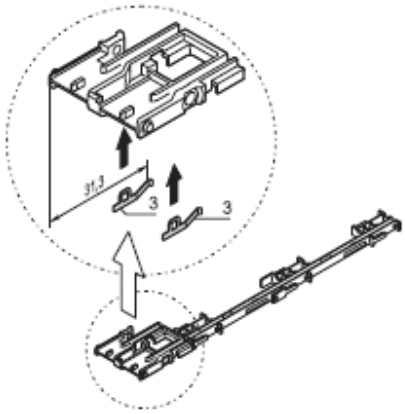
ESD clip



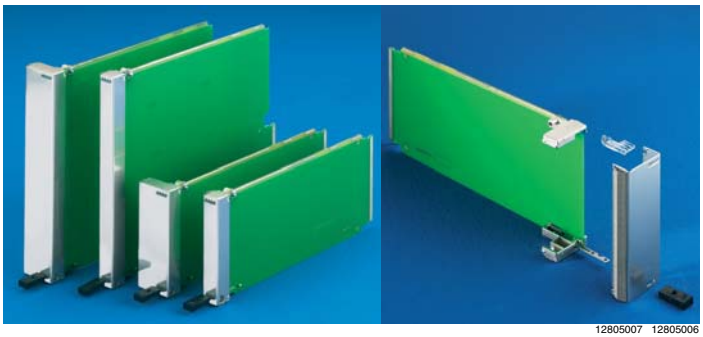
12805060

- Specific combinations allow to assemble up to 8 AdvancedMC modules (8 x SW / HH) in a Carrier
  - Strut (splitting extrusion) is assembled between the cover plates (retainer for ESD Clip)
  - Guide rail is clipped onto the cover
  - Guide rail is always included with splitting extrusion (strut) and guide rail

Order Information

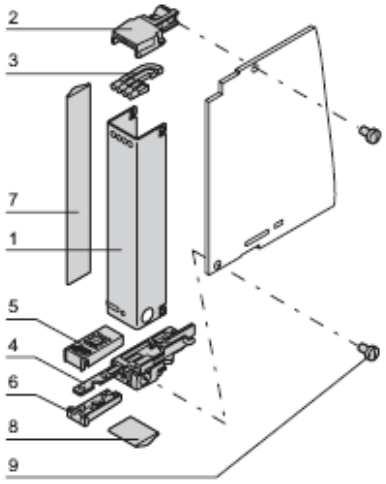
Item	Description	Qty / PU	Order no.
1	Splitting extrusion (strut) between cover A (left) and B (right), Zn die-cast, nickel-plated	10	**20849-009**
1a	Splitting extrusion (strut) for cover B (right), Zn die-cast, nickel-plated	10	**20849-010**
1b	Splitting extrusion (strut) for cover A (left), Zn die-cast, nickel-plated	10	**20849-011**
2	AdvancedMC guide rails, PBT, UL 94 V-0, red	10	**20849-008**
3	ESD clip, stainless steel spring, for deflection of electrostatic discharge	50	**20849-021**

AdvancedMC module mechanics



12805007 12805006

- Kit, shielded
- Locking of the module without screw
- For Conventional, Cutaway and Hybrid Carrier
- Insertion / extraction mechanics in accordance with AdvancedMC standard
- Insertion / extraction mechanics designed for micro switch operation (hot-swap)
- Inclusive of Light Pipe

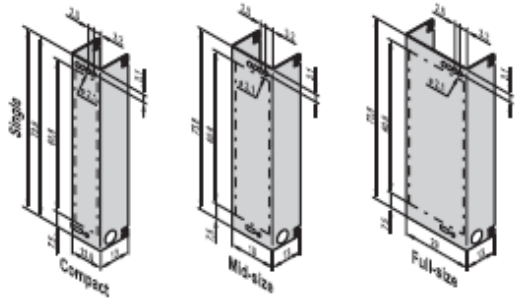


12805061

Delivery comprises (kit)

Item	Qty	Description
1	1	U-front panel, St, 0.6 mm
2	1	Retainer for Light Pipe and board retainer, Zn die-cast, nickel-plated
3	1	Light Pipe, PC UL 94 V-0
4	1	Insertion / extraction mechanics with micro switch operation and board retainer
5+6	1	Handle, PC UL 94 V-0, black
7	1	EMC gasketing, core: foam, sleeve: textile cladding with CuNi mesh
8	1	EMC gasketing at bottom, core: foam, sleeve: textile cladding with CuNi mesh
9	1	Assembly kit

Single AdvancedMC module



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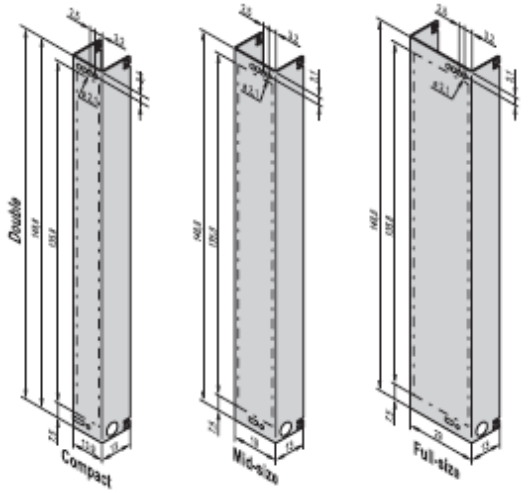
Double AdvancedMC module



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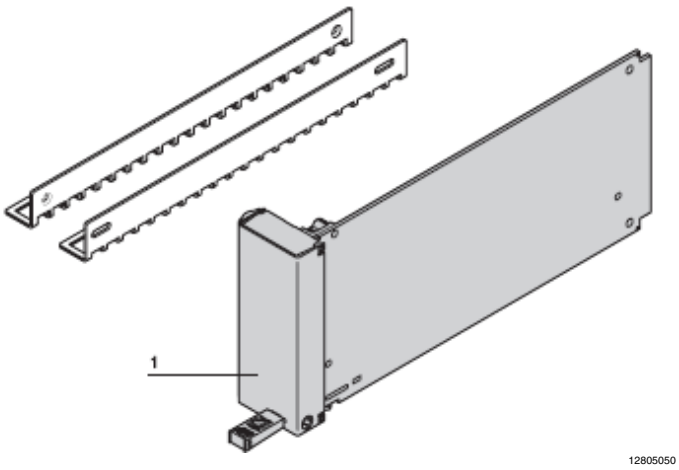
Order Information

Description	Qty / PU	Order no.
AdvancedMC module mechanics SW / HH	1	**20849-002**
AdvancedMC module mechanics SW / FH	1	**20849-004**
AdvancedMC module mechanics DW / HH	1	**20849-003**
AdvancedMC module mechanics DW / FH	1	**20849-005**
Micro switch for AdvancedMC module (normally open) for soldering (SMD), PU 10 pieces		**20849-065**
Micro switch for AdvancedMC module (normally closed) for soldering (SMD), PU 10 pieces		**20849-015**

Note

- Single Mid-size and Double Mid-size AdvancedMC modules on request
- Filler module (filler panel), see page 26
- Micro switch for AdvancedMC modules, see page 27

AdvancedMC filler module (filler panel)



- For Conventional, Cutaway and Hybrid Carrier
- Insertion / extraction mechanics in accordance with AdvancedMC standard
- Identical design to AdvancedMC module

Delivery comprises (assembled)

Item	Qty	Description
1	**1**	**AdvancedMC filler module**
	1	U front panel, stainless steel, 0.6 mm
	1	Board retainer, Zn die-cast, nickel-plated
	1	Printed board
	1	Insertion / extraction mechanics and board retainer
	1	Handle, plastic, PC UL 94 V-0, black
	1	EMC profile sealing, core: foam material, sleeve: textile cladding with CuNi mesh
	1	EMC profile sealing at bottom, core: foam, sleeve: textile cladding with CuNi mesh

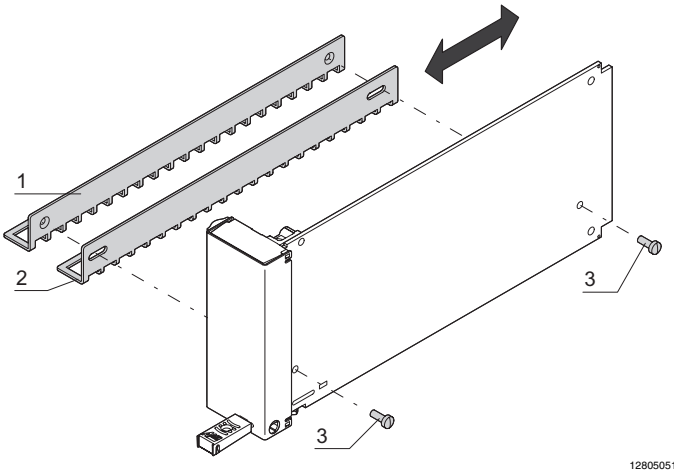
Order Information

Description	Qty / PU	Order no.
AdvancedMC Filler module SW / HH	1	**20849-022**
AdvancedMC Filler module SW / FH	1	**20849-024**
AdvancedMC Filler module DW / HH	1	**20849-023**
AdvancedMC Filler module DW / FH	1	**20849-025**

Note

- Single Mid-size und Double Mid-size AdvancedMC filler module on request
- Front panel dimensions, see page 25
- Please order air baffle separately, see page 26

Air Baffle for filler module



- Grille adjustable between 60 and 80 %
- Can be retrofitted

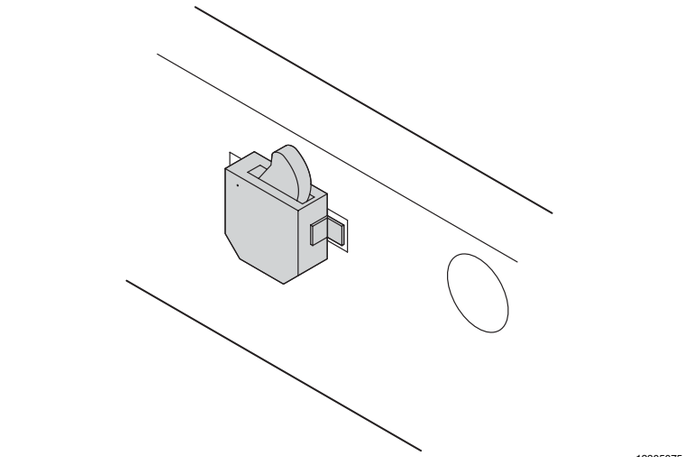
Delivery comprises

Item	Qty	Description
1	1	Metal with perforation, Al
2	1	Sliding metal with perforation, Al
3	1	Assembly kit

Order Information

Description	Qty / PU	Order no.
Air baffle for AdvancedMC Filler module HH	10	**20849-016**
Air baffle for AdvancedMC Filler module FH	10	**20849-017**
Air baffle for AdvancedMC Filler module FH, printed board	10	**20849-018**

Micro switch for AdvancedMC Carrier



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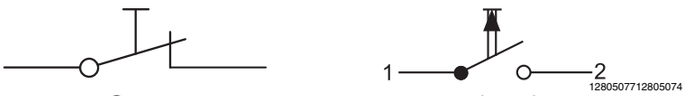

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- Micro switch for soldering (SMD)

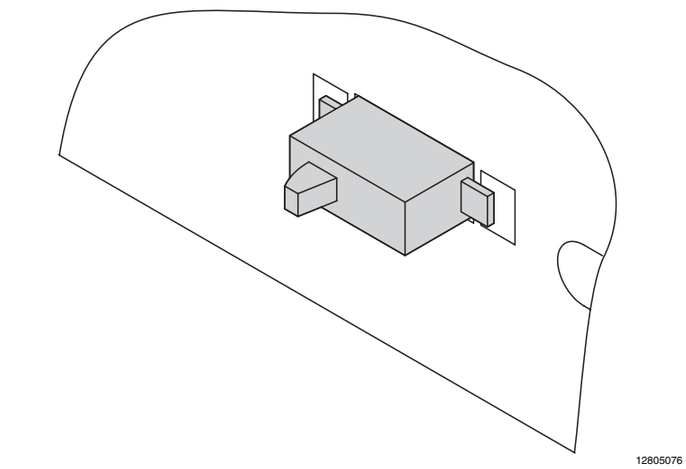
Order Information

Description	Qty / PU	Order no.
Micro switch for Carrier	10	**20849-064**
Micro switch for AdvancedMC Carrier module	10	**20849-020**

Technical Data

Max. switch current	10 mA
Operating temperature	-25°C ... +80°C
Electrical life expectancy	10^5

Micro switch for AdvancedMC module



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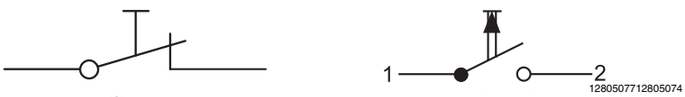

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- Micro switch for soldering (SMD)

Order Information

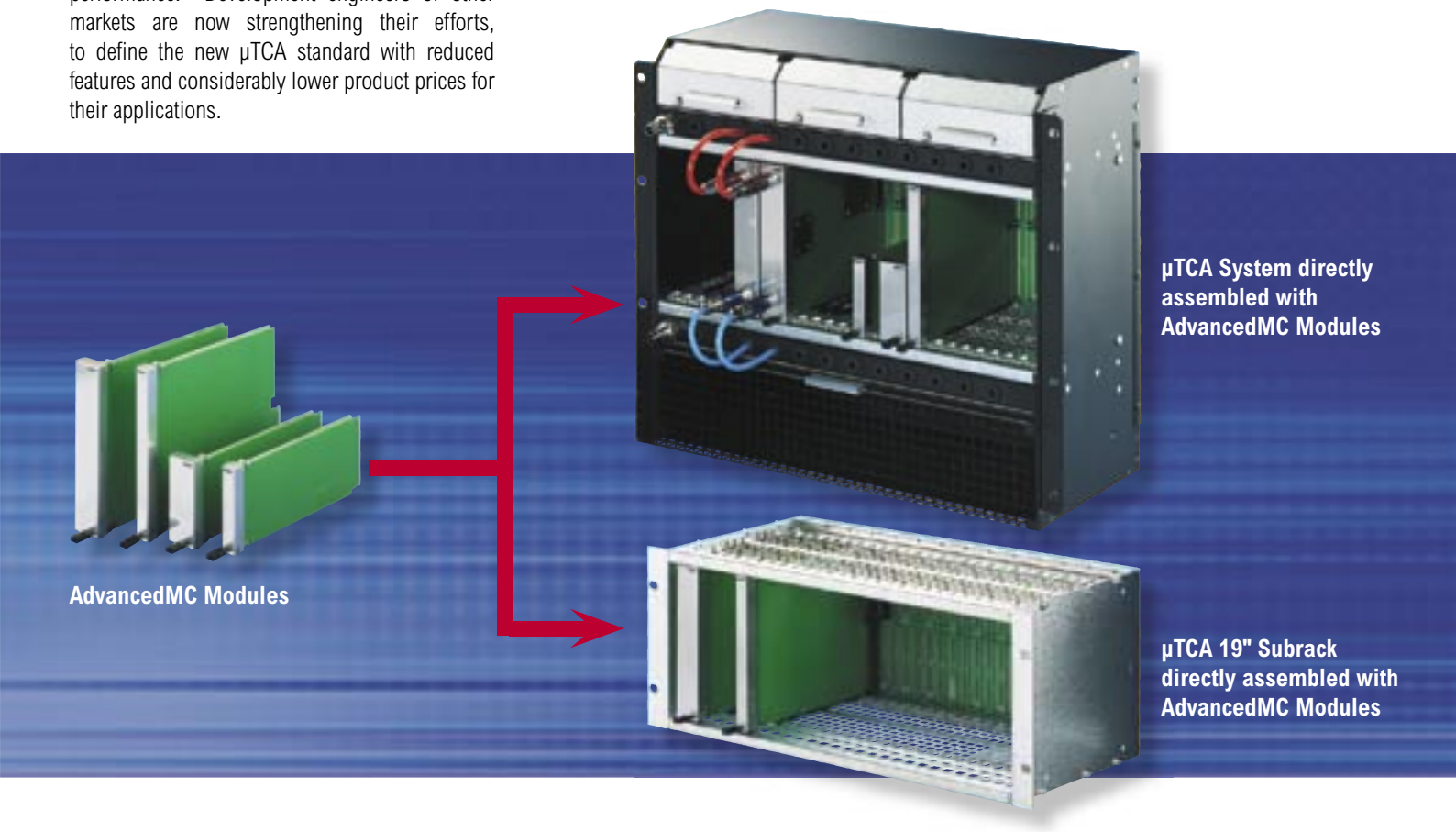
Description	Qty / PU	Order no.
Micro switch for AdvancedMC module	10	**20849-065**
Micro switch for AdvancedMC module	10	**20849-015**

Technical Data

Max. switch current	10 mA
Operating temperature	-25°C ... +80°C
Electrical life expectancy	10^5

Micro Telecom Computer Architecture

AdvancedTCA enhanced by AdvancedMC was specified by PICMG for the application in telecommunication markets with the highest performance. Development engineers of other markets are now strengthening their efforts, to define the new µTCA standard with reduced features and considerably lower product prices for their applications.


µTCA System directly assembled with AdvancedMC Modules
AdvancedMC Modules
µTCA 19" Subrack directly assembled with AdvancedMC Modules

Dimensions

With a maximum depth of only 200 mm in comparison to AdvancedTCA more subracks can be housed in a smaller cabinet.
The adaptation into 300 mm deep ETSI racks is possible. The width and height of the subracks correspond to the well-known 19" dimension, whereby part width are planned (Cube, Pico).

Performance Loss

Apart from the applications with heat loss of approx. 20 W for the smallest AdvancedMC modules and approx. 80 W for the largest AdvancedMC modules, there are also applications, which manage without additional cooling.

Periphery

Suitable cooling and power supply units are made available separately and are not integrated as a rule. This leads to a considerable cost reduction, but the construction of a complete system similar to AdvancedTCA is possible and taken into account in the standard.

µTCA is a very modular standard with the aim to assemble AdvancedMC modules without carrier board directly on a backplane. This line of thought expands the user spectrum for AdvancedMC in the low end area of cost critical applications, such as base stations (Wireless), access units (Wireline) or elements of smaller networks.

The dimensions of the new µTCA subracks and systems which are required for this are aligned to modules described in the AdvancedMC RC1.1 standard.

MicroTCA Carrier Hub

For the operation of an AdvancedMC module a so-called MicroTCA Carrier Hub (MCH) is required. In the original application of AdvancedTCA carriers the management, for instance the validation check of the modules during a hot-swap, is carried out by the AdvancedTCA carrier. As this carrier is now replaced by a backplane, the corresponding management has to be arranged on another board, which is the so-called MCH. The MCH takes over the management as well as the switching functions.

Standards

The subracks will fulfil all required standards such as UL, NEBS etc. and be equipped with a backplane, on which the AdvancedMC modules make contact. Similar to AdvancedTCA it is also planned to standardise complete systems.

Roadmap

The µTCA standard was issued in June 2006. Schroff is responsible for the mechanical part of the standard.

µTCA development system, 6 U

12806006

- In accordance with standard
  - PICMG MicroTCA.0 Draft 0.9
  - PICMG AMC.0 RC 1.1
- µTCA development system, 6 U (in ratiopacPRO case) with front handles (19" panel/slide mount optional)
- Board section for Single AdvancedMC module
- µTCA backplane, 14 slot (2+2+10, 2 power supply slots, 2 Management Carrier Hub (MCH) slots, 10 AMC slots)
- Active cooling (air flow from front to rear)
- Hot-swap fan modules with three temperature controlled 12 V_{DC} fans
- Air filter exchangeable from the front
- Accessories
  - rear power supplies (12 V_{DC} or 48 V_{DC})
  - power input module for +12 V from an external power supply onto the µTCA backplane

Case	19" ratiopacPRO case, 6 U, 316 mm deep, two slots for power supplies, board section 200 mm deep, air filter exchangeable from the front
Cooling	Air flow from front to rear, fan modules hot-swappable, three fans with 170 m^3/h (100 cfm) temperature dependent fan speed control (NTC)
Voltage supply	Power supply: 300 W, AC - DC, N+1 redundant for DC voltages, power input module: input 12 V_{DC}, output 12 V_{DC} and 3.3 V_{DC} / 5 A

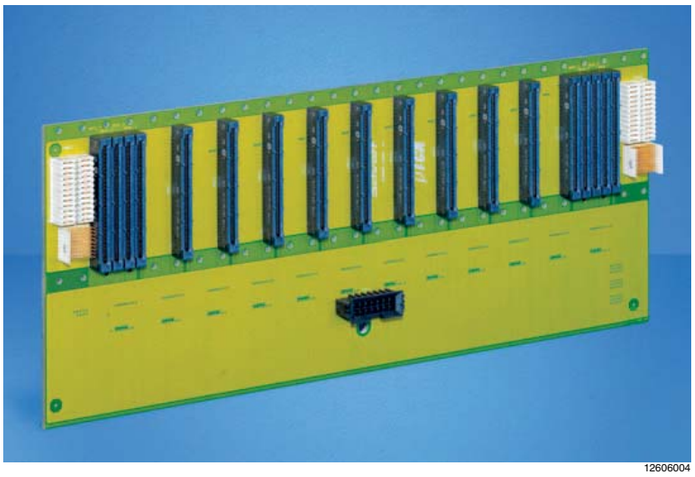
Order Information

Description	Qty / PU	Order no.
µTCA development system, 6 U	1	**11596-003**
Power supply 300 Watt, AC - DC (12 V) input 85 ... 264 V_{AC}, output 12 V_{DC} / 25 A, 1 piece		**11098-287**
Power supply 300 Watt, AC - DC (48 V) input 85 ... 264 V_{AC}, output 48 V_{DC} / 6.25 A, 1 piece		**11098-288**
µTCA power input module input 12 V_{DC}, output 12 V_{DC} and 3.3 V_{DC}/5 A, 1 piece		**23098-549**

Note

- µTCA development system for Double AdvancedMC modules on request
- Other backplanes on request. Description of µTCA backplane, see page 33
- Description of µTCA power input module, see page 34

µTCA backplanes



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- In accordance with:
  - PICMG eTCA D0.9
- Special topologies for development purposes

Delivery comprises

Item	Qty	Description
1	1	Backplane, fully assembled

Order Information

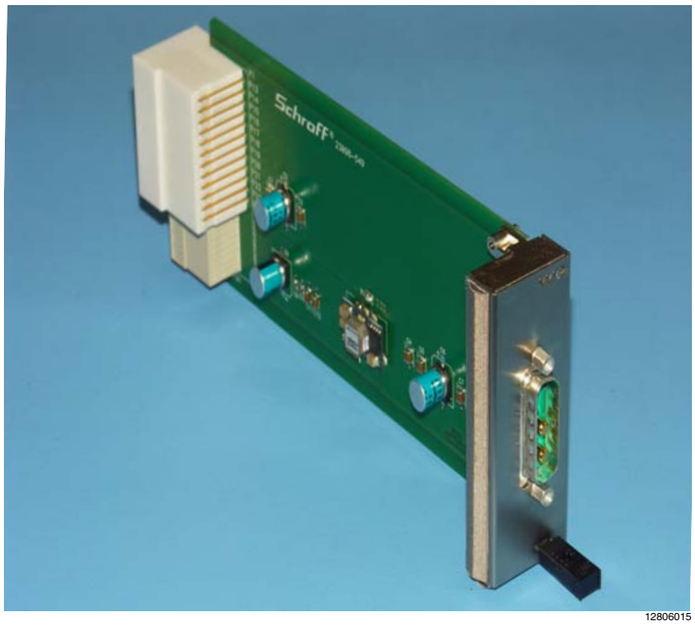
Number of slots	Width mm	Height mm	Description	Qty / PU	Order no.
10	425.0	169.9	10 slots AMC Full-size, 2 redundant hubs (MCH slots), 2 Power Module slots (PM)	1	**23005-406**
12	425.0	169.9	8 slots Full-size, 4 Compact slots, 2 hubs (MCH slots), 2 Power Module slots (PM)	1	**23005-407**

Technical Data

	Backplane 2 + 2 + 10	Backplane 2 + 2 + 12
Slots	10 AdvancedMC Single Full-size, 2 redundant µTCA Carrier hubs (MCH), 2 redundant power supplies	12 AdvancedMC (8 Single Full-size, 4 Compact), 2 redundant µTCA Carrier hubs (MCH) , 2 redundant power supplies
IPMI	Radial IPMI from both MCH slots to all AdvancedMC and power supply slots	Radial IPMI from both MCH slots to all AdvancedMC and power supply slots
Clock Connections	CLK1 CLK3: radial from each MCH to all AdvancedMC slots CLK2: radial from each AdvancedMC slot to both MCH slots, incl. termination	CLK1: radial from MCH 2 to all AdvancedMC slots CLK2: radial from each AdvancedMC slot to both MCH slots, incl. serial termination CLK3: same topology as Fat Pipe Port 4 ... 7
General	AdvancedMC Port 0 and 2 to MCH 1, AdvancedMC Port 1 and 3 to MCH 2	AdvancedMC Port 0 to MCH 1, AdvancedMC Port 1 to MCH 2
Fat Pipe Advanced MC	Port 4 ... 11 connection between AMCs: AMC1-AMC2, AMC3-AMC4, ...	Port 4 ... 7 from MCH 1 radial connection to slots 2, 3, 5, 7, 10, 11, point-to-point connection slots 1 to 4

- Further information on the Internet

µTCA Power Input module, Single, Full-size



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- Input of +12 V_{DC} from an external power supply onto the µTCA backplane
- Voltage supply of the AdvancedMC and Management Carrier Hub (MCH) modules and the fan trays
- In addition generation of the +3.3 V_{DC} management voltage
- Is used instead of a µTCA Power module in the µTCA system (Single, Full-size); connector and form factor compatible
- Voltage input +12 V_{DC} via D-Sub connector on the front panel
- 16 times +12 V_{DC} voltage output

Order Information

Description	Qty / PU	Order no.
Input 12 V_{DC}, output 12 V_{DC} and 3.3 V_{DC}/ 5 A, 1 piece	1	**23098-549**
Connecting cable Power supply 12 V_{DC} output to Power module (for development system 11596-003)		**23204-176**
Connecting cable Power supply -48 V_{DC} output to µTCA Power module (for development system 11596-003)		**23204-177**

Note

- Further versions on request
  - Hot-swap voltage switching
  - Voltage disconnection at too high input (> 13 V_{DC}), as safeguard against unwanted input of -48 V_{DC} onto the µTCA backplane

Further information:
www.a-tca.com or AdvancedTCA E-mail hotline:
Europe, Asia: infoATCA@schroff.biz
America: infoATCA@pentair-ep.com

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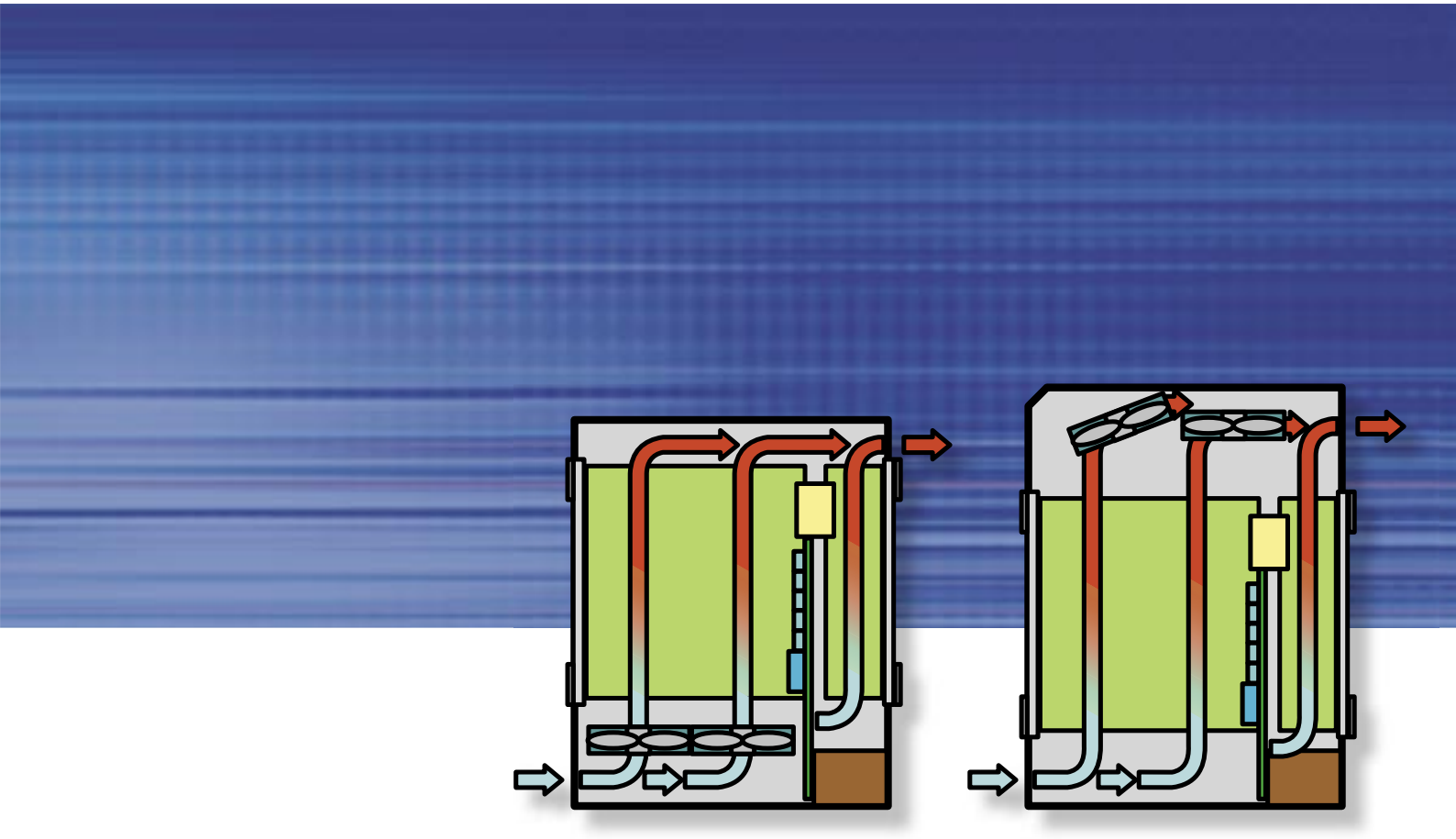
high processing densities
maximum operability
ESS 2005
The Embedded Systems Show
October 19th-20th, 2005
NEC, Birmingham

12705003

Air Cooling

The AdvancedTCA standard defines a 99.999% systems availability. This also applies to the cooling and demands a redundant cooling concept, so that the failure of a fan does not affect the operation of the system. Strict guide lines of the NEBS (America) and ETSI (Europe) determine the upper limits for the noise generation.

The compact structure of AdvancedTCA systems presents a further challenge. With systems a heat loss of up to 3.4 kW can be generated - with three systems in a cabinet it can therefore increase to more than 10 kW.



Cooling in Systems:
Push or Pull Cooling?

Basically there are several ways to cool systems. Even today liquid cooling is not yet accepted for telecom applications. Therefore, air cooling, which forces cool air at high speed past components that require cooling, is the only possibility. In general two different approaches are possible: Push Cooling or Pull Cooling.

Push Cooling

- Axial or diagonal fans push the air into the system
- Extended life of fans
- Reduced space requirement, system height: 12 U
- High pressure prevents dust accumulation on the components

Pull Cooling

- Radial fans pull hot air out of the system
- Performance losses of the fans are taken away with this systems
- Better air distribution inside the system
- High static pressure

Water Cooling

From today's view point cooling is the critical aspect of the AdvancedTCA systems. This situation will intensify even more, as signs point to further increasing performance losses of the components. Schroff has therefore put great emphasis on optimum cooling during the development of their AdvancedTCA systems.

The cooling of processors on µTCA boards often demands water cooling already.

For cabinets with 2 to 3 AdvancedTCA systems the limits for air cooling have been exceeded. A heat loss of 10 kW in cabinets demands an air/water heat exchanger.

Schroff has developed a solution based on the cabinet platform Varistar:

- Up to 20 kW cooling capacity
- Integrated compact heat exchanger
- Even cooling of all systems
- Optimum safety through:
  - Perfect system balance
  - Integrated communication interfaces
  - Redundant power supply

Overview PICMG 3.0 AdvancedTCA

The **A**dvanced **T**elecom **C**omputer **A**rchitecture standard was first specified only for the telecommunication market, but on this platform other products for high-performance networks can be built.

AdvancedTCA allows the manufacturer of central office equipment also to replace proprietary systems by standardised systems.

A new form factor was defined, with a board height of 8 U, a board depth of 280 mm and an I/O board depth (RTM) of 70 mm. The front panel width is 6 HP, where the board is offset 0.1". This offset allocates more space on the rear side of the board for SMT components. The mounting of the EMC gasket on the front panel reduces the danger of the components or the EMC gasket being damaged during the extraction of the boards. The new handles were optimised in accordance with the withdrawal forces.
With AdvancedTCA, the common parallel bus was replaced by a fast serial connection. If a Dual Star backplane is used, 2 Fabric and 12 Node boards can be inserted in an AdvancedTCA system which is to be mounted in a 19" cabinet. With a Full Mesh backplane 14 Node boards can be used. Other backplane architectures, for example Dual Dual Star and Replicated Mesh are possible. In the same way the AdvancedTCA standard allows the construction of a 16 slot system which fits in a 23" Telecom or 600 mm ETSI cabinet. AdvancedTCA systems are designed for a maximum energy loss of 200 W per board. A 14 slot AdvancedTCA system can generate up to 2.8 kW performance loss.

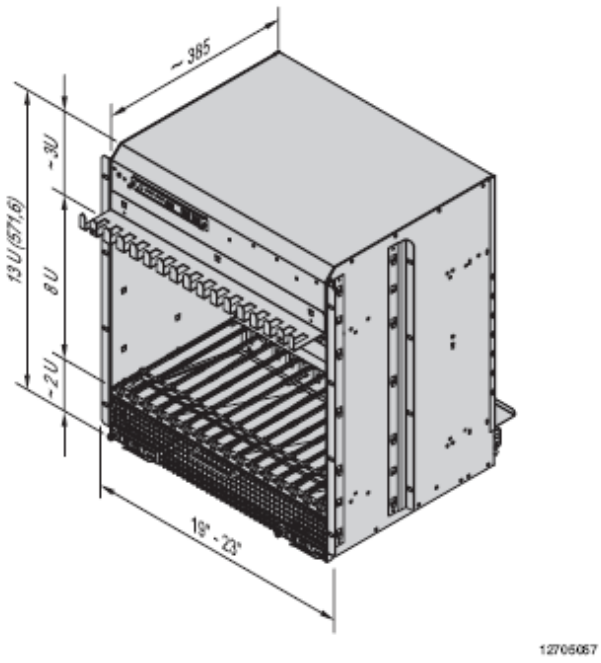
The whole data throughput of the system depends on the selected Fabric layer, the protocol and the Fabric architecture and can reach more than 1 Tb/s. Until now, Ethernet (PICMG 3.1), Infiniband (PICMG 3.2) and StarFabric (PICMG 3.3) Fabric layers were defined. The PCI Express (PICMG 3.4) standard is designed at the moment.

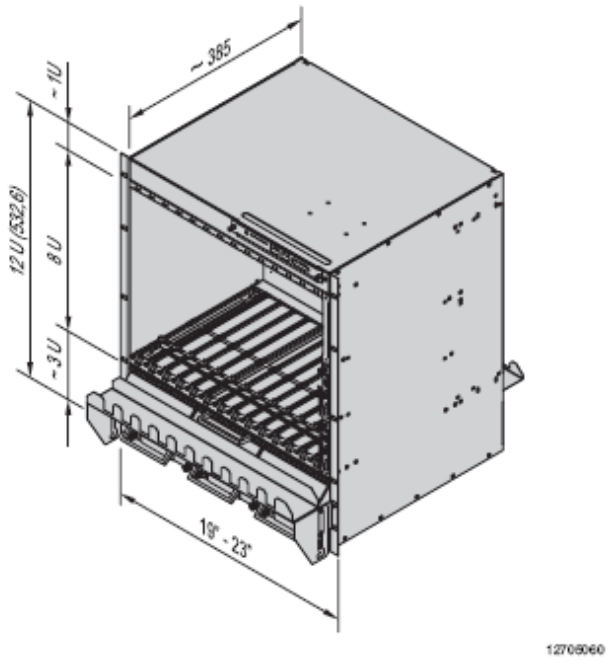
The connectors in an AdvancedTCA system are divided in three different groups, zone 1 to 3.

- Connector zone 1 provides the current, the primary (IPMI) management system as well as the geographical address of the board.
- On the connector zone 2, a 10/100/1000 BASE-T base interface and a Fabric interface are defined. The Base interface is used for the transmission of FLASH Memory Images, the downloading of Firmware as well as High Level Management Function. The Fabric interface is for the high-speed transfer of big data volumes.
- The connectors zone 3 are set by the individual applications. The 70 mm depth RTM (Rear Transition Module) is connected directly with the front board. Therefore both electrical and optical connectors can be inserted between front board and Rear Transition Module.

A high-capacity management system with electronic coding assures the monitoring and engaging of the board. It supports the Fabric ports, cooling as well as remote control and software updates.

AdvancedTCA chassis

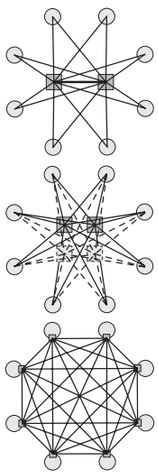




Full Mesh / Dual Dual Star / Dual Star

Schroff supports a range of AdvancedTCA backplane topologies.
The main goal of the development of the AdvancedTCA standards was a scalable architecture which allows a consideration of performance and costs. A further goal was an alternative for the parallel bus on the backplane, as this causes a hold-up of the data throughput and is a frequent breakdown reason.

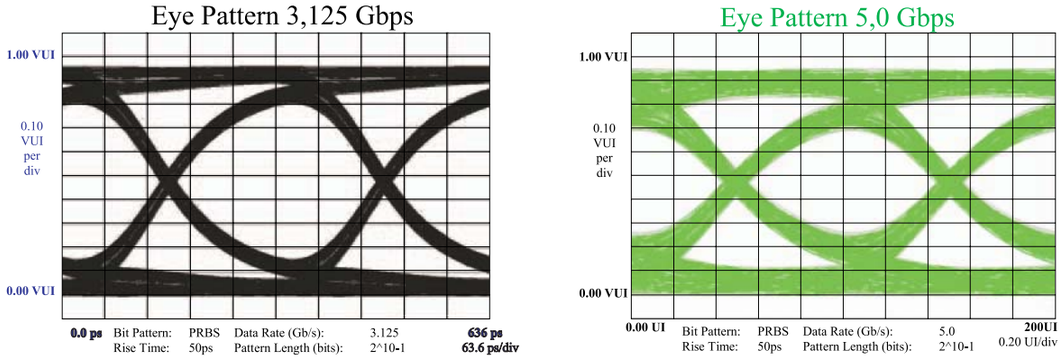
The AdvancedTCA backplane is the first backplane which is designed based on an open standard, which only supports package based architectures (switched fabrics). The scalability is granted because of several topology options, which support one, two or four ports per channel (link between slot), and because of the Dual Star, Dual Dual Star or Full Mesh connection.



In a **Dual Star** topology all slots are connected with a Star, on which a Fabric switch is placed. A second switch (dual) assures the redundancy which is important for the system availability. All slots communicate with switches in the Hub slot.

For a higher performance a second group with two redundant switches can be added and a **Dual Dual Star** configuration can be created.

The highest capacity is reached with a **Full Mesh** configuration, in which every slot is directly connected with all other slots. Without the restrictive fabric switches, the data bandwidth can reach more than 2.5 Tbps.



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Radial and bussed IPMI topology

Schroff backplanes support both radial and IPMI configurations.
IPMI, which runs on I^2C, with several AdvancedTCA specific extras, is used for the primary low level Shelf Management communication channel. In the chassis are two independent (redundant) IPMI interfaces. Normally a bussed IPMI solution has been chosen: That means, that all slots are connected with redundant, parallel I^2C busses.

There were concerns about AdvancedTCA boards and chassis that in a worst case scenario both IPMI busses could be blocked and no Shelf Management would be available. To avoid this, IPMI interfaces can be routed in a Dual Star (radial) configuration, so that both interfaces of every slot are separately connected with every Shelf Manager. The implementation of radial IPMI can increase the costs for the AdvancedTCA system because of the higher versatility.

Shelf Management

Schroff offers state-of-the-art Shelf and Thermal Management products for AdvancedTCA systems.
The Shelf Manager inherits considerably more tasks in an AdvancedTCA environment than in a CompactPCI chassis. The Shelf Manager controls and monitors the fans, the temperature and the power supply in a CompactPCI system. The Shelf Manager controls the chassis environment and also all boards in an ATCA system. To introduce the electronic coding was a main focus of the standardisation work. Instead of few coding blocks, which should prevent that a board is plugged into a wrong slot, the electronic coding enables the Shelf Manager to support only those Fabric ports on an AdvancedTCA board which are compatible with boards on the other end of the Fabric connection.

When an AdvancedTCA board is assembled into the Shelf, the Shelf Manager compares the features of the board with the features available in the system. It compares the current, the cooling and the Fabric signalling levels (protocols) per channel, the available ports per channel and the backplane topology to this, which is connected on the other end of the Fabric connection. The Shelf Manager assigns current to the board, allows 'power up' of the board and engages only those board features, which are compatible with the remaining Shelf. This detailed Shelf Management prevents damage to the boards by electrical incompatibility and eliminates an unreliable system configuration. Furthermore, the Shelf Manager creates a list of the boards which are installed in the Shelf as well as a list of the components. (Remote) access to this list is possible via a network interface to the Shelf Manager.